



BIS global liquidity indicators: methodology

The term “global liquidity” is used by the BIS to mean the ease of financing in global financial markets. Credit is among the key indicators of global liquidity and the focus of the global liquidity indicators (GLIs) constructed by the BIS (Domanski et al (2011)). Global liquidity in general and credit in particular influence the build-up of financial system vulnerabilities in the form of asset price inflation, leverage, or maturity or funding mismatches (Caruana (2014)).

The BIS constructs three indicators of global liquidity: banks’ international claims, banks’ total claims on the private non-financial sector, and total credit by currency of denomination. These indicators draw on national data and BIS international banking and financial statistics, but incorporate assumptions and estimations by BIS statisticians. Borrowers are grouped based on the country in which they reside. The methodology behind each of the indicators is explained below.

The BIS GLIs are constructed quarterly and published concurrently with the *BIS Quarterly Review*. They can be viewed and downloaded in the BIS Statistics Explorer (stats.bis.org/statx/toc/GLI.html) and through the BIS Statistics Warehouse (stats.bis.org/bis-stats-tool).

The term “country” as used in this document also covers territorial entities that are not states as understood by international law and practice but for which data are separately and independently maintained.

Questions about the GLIs may be addressed to statistics@bis.org.

Contents

- BIS global liquidity indicators: methodology 1
- 1. Assessing global liquidity conditions 2
- 2. Banks’ claims..... 2
 - 2.1 Banks’ international claims 2
 - 2.2 Banks’ total claims on the private non-financial sector 3
- 3. Total credit to non-bank borrowers by currency of denomination..... 4
 - 3.1 Total credit to non-residents..... 5
 - 3.2 Total credit to residents..... 6
- 4. Annual percentage changes..... 7
- 5. References 7
- Annex A: Components of foreign currency credit..... 8
- Annex B: Revisions and breaks 9

1. Assessing global liquidity conditions

The interaction of private and official factors determines the economy's overall ease of financing. For instance, financial institutions provide market liquidity to securities markets through their trading activities, and provide funding liquidity to borrowers through their lending activities. The terms on which these intermediaries can fund themselves depend on the willingness of other market participants to interact with them. Prudential and macroeconomic policies, including the conditions under which central banks provide funding to the financial system, will affect these interactions (Eickmeier et al (2013)).¹

The outstanding amount of credit shows how far the ease of financing has led to a build-up of exposures. In other words, credit to private sector borrowers reflects the outcome of financial intermediation in global markets. Unusually rapid changes in outstanding credit are associated with the build-up of vulnerabilities, with potential implications for financial stability. Much of this credit, although not all, is provided by banks, so the BIS indicators focus primarily on bank credit.

Of particular interest for the assessment of global liquidity is the international component of credit, in the form of cross-border lending and local lending denominated in foreign currencies. This is because the international component often provides the marginal source of financing in the run-up to financial crises. Although the international component is often small relative to total credit, swings in this component can amplify domestic trends and are highly correlated with booms and busts in global financial conditions.

Any assessment of global liquidity conditions requires that measures of global credit be put into perspective. Moreover, the informativeness of indicators changes over time, implying that a flexible and multifaceted approach is needed when assessing global liquidity conditions (Committee on the Global Financial System (2011)). A range of supplementary price and quantity indicators can be used to capture additional specific aspects of global liquidity that are relevant for financial stability. These include measures of financing conditions in key financial markets and incentives for position-taking across market segments. These indicators tend to include proxies for risk appetite, which is a major driver of leverage and the willingness of private investors to provide funding.

2. Banks' claims

Table E1 (stats.bis.org/statx/srs/table/e1)

2.1 Banks' international claims

International claims are defined as banks' cross-border claims denominated in all currencies plus their local claims denominated in foreign currencies:

$$INTC_{s,t} = XBC_{s,t} + LCFX_{s,t} \quad (1)$$

where $INTC_{s,t}$ = banks' international claims on sector s at time t ;

¹ For analysis and research about global liquidity, see the references listed under "More information" at www.bis.org/statistics/gli.htm.

$XBC_{s,t}$ = banks' cross-border claims on sector s at time t ;
 $LCFX_{s,t}$ = banks' local claims in foreign currencies on sector s at time t .

Claims refer to banks' financial assets: loans, holdings of debt and equity securities, derivatives and other financial instruments. Data are from the BIS locational banking statistics (LBS) and exclude the claims of banks located in countries that do not report the LBS.²

$INTC_{s,t}$ is calculated for all counterparty sectors in aggregate as well as for two individual counterparty sectors s : banks and non-banks. The non-bank sector comprises non-financial corporations, general government, households and non-bank financial institutions. Claims on the bank sector include banks' positions vis-à-vis affiliates within the same banking group. Claims on all sectors include claims on non-banks, banks and claims unallocated by sector.

Table E1 shows banks' outstanding international claims as a percentage of GDP and their annual percentage change (calculated as explained in section 4). The level of international claims is scaled by global GDP from the latest IMF *World Economic Outlook*. In order to calculate series with quarterly frequencies, annual GDP data are linearly interpolated.

2.2 Banks' total claims on the private non-financial sector

Banks' total claims on the private non-financial sector (PNFS) are the sum of their local claims and cross-border claims. The PNFS is composed of non-financial corporations and households. Local claims are obtained from BIS series on bank credit to the non-financial sector (CNFS).³ Cross-border claims are obtained from the LBS. Cross-border claims include claims on the non-bank financial and government sectors, in addition to the PNFS, ie cross-border claims refer to claims on the non-bank sector.

For LBS-reporting countries, growth of local claims in all currencies from the CNFS series are adjusted for exchange rate movements by combining them with local claims in foreign currency from the LBS as follows:

$$local\ claims\ adjusted\ growth_{i,t} = \frac{\Delta \left((lcusd_{i,t} - lcfc_{i,t}) * xr_{end_{i,t}} \right) + lcfcf_{i,t} * xr_{avg_{i,t}}}{lclc_{i,t-1}} \quad (2)$$

where i indicates the country and t the quarter.

$lcusd$ = local claims expressed in US dollars, converted at end-of-period US dollar bilateral exchange rate (from BIS CNFS);
 $lclc$ = local claims expressed in local currency (from BIS CNFS);
 $lcfc$ = local claims in foreign currency expressed in US dollars, amounts outstanding (from BIS LBS);
 $lcfcf$ = local claims in foreign currency expressed in US dollars, exchange rate and break-adjusted changes (from BIS LBS);
 xr_{end} = end-of-period US dollar bilateral exchange rate;
 xr_{avg} = average-of-period US dollar bilateral exchange rate.

² For further information on the locational banking statistics, see www.bis.org/statistics/about_banking_stats.htm. For a list of LBS-reporting countries, see www.bis.org/statistics/rep_countries.htm.

³ For further information on the BIS credit series, see www.bis.org/statistics/totcredit.htm.

Using the local claims adjusted flow for each LBS-reporting country annual percentage changes are calculated.

For non-LBS-reporting countries, local claims are assumed to be denominated in the local currency (hence, no adjustment is made for local claims in foreign currencies). For these countries, annual percentage changes are calculated based on simple changes in stocks.

Table E1 and Graph E2 show banks' total claims by region, as defined in Table 1 below. Regional averages are weighted by countries' GDP, where GDP is a four-quarter moving sum.

Countries included in total claims on the private non-financial sector		Table 1
<i>Region (number of countries)</i>	<i>Countries included in region</i>	<i>Code¹</i>
All countries (40)	All countries listed below plus United States	5J
Euro area (11)	Austria, Belgium, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Spain, Greece	5C
Other advanced economies (9)	Australia, Canada, Denmark, Japan, New Zealand, Norway, Sweden, Switzerland, United Kingdom	2R
Emerging Asia (8)	China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Singapore, Thailand	4Y
Central Europe (3)	Czech Republic, Hungary, Poland	6E
Latin America (4)	Argentina, Brazil, Chile, Mexico	4U
Other emerging market economies (4)	Russia, Saudi Arabia, South Africa, Turkey	2A

¹ Code used to identify the series in the BIS Statistics Explorer, BIS Statistics Warehouse and single CSV file.

3. Total credit to non-bank borrowers by currency of denomination

US dollar Table E2.1 (stats.bis.org/statx/srs/table/e2?m=USD)

Euro Table E2.2 (stats.bis.org/statx/srs/table/e2?m=EUR)

Japanese yen Table E2.3 (stats.bis.org/statx/srs/table/e2?m=JPY)

Total credit by currency of denomination is composed of credit extended by all (foreign and domestic) lenders. Specifically, it is composed of loans extended by banks and purchases of debt securities by both banks and non-banks (as proxied by issues of debt securities).

For each currency, total credit can be decomposed into credit to residents of countries for which the selected currency is domestic (*credit to residents*) and credit to residents of countries for which the selected currency is foreign (*credit to non-residents*). For example, for the US dollar series, *credit to residents* refers to US dollar-denominated credit to US residents and *credit to non-residents* refers to US dollar-denominated credit to borrowers residing outside the United States.

$$\text{Total credit}_{c,t} = \text{Credit to residents}_{c,t} + \text{credit to non-residents}_{c,t} \quad (3)$$

where c is the currency of denomination (USD, EUR or JPY) and t is the quarter.⁴

A breakdown of credit to non-residents by borrowing location is calculated for emerging market economies (EMEs), as a total and separately for the four main EME regions. In addition, country-level foreign currency credit (FCC) is published for selected EMEs. For a detailed overview of the FCC components by country and currency, see annex A.

3.1 Total credit to non-residents

Credit to borrowers outside the currency-issuing jurisdiction consists of three main components: international debt securities (ids), cross-border bank loans (xbi) and locally-extended bank loans in foreign currency ($llfx$).

$$credit\ to\ non-residents_{i,c,t} = ids_{i,c,t} + xbi_{i,c,t} + llfx_{i,c,t} \quad (4)$$

where i indicates the borrower location, c the currency of denomination (USD, EUR or JPY) and t the quarter.

The BIS international debt securities statistics (IDSS) allow for a breakdown by sector into banks, non-bank financials and non-financials. Graph E3 shows debt securities issued by non-residents in the non-financial sector. Table E2.1–3 includes non-resident issuance of debt securities for the non-bank as well as the non-financial sector. For the IDS used in the GLIs, the country is assigned based on the residency of the issuer.

$$ids\ nb_{i,c,t} = ids\ nbf_{i,c,t} + ids\ nf_{i,c,t} \quad (5)$$

where $ids\ nb$ = international debt securities issued by non-banks;
 $ids\ nbf$ = international debt securities issued by non-bank financial institutions (immediate issuer sector);
 $ids\ nf$ = international debt securities issued by non-financial entities (immediate issuer sector).

For IDS issued in US dollars, US dollar-denominated issuance in the Cayman Islands by US-based entities is excluded on the assumption that this represents credit to US residents. For IDS issued in euros, the issuance of the European Financial Stability Facility (EFSF), the European Financial Stabilisation Mechanism (EFSM) and the European Stability Mechanism (ESM) are excluded.

The bank loans data come from the LBS and refer to loans to the non-bank sector, including non-bank financial institutions.⁵

The cross-border component is directly taken from reported LBS data. In addition, global US dollar credit to non-residents includes national data on cross-border loans from banks in China for the period Q1 2010 to Q3 2015, before China became an LBS-reporting country.⁶

⁴ All amounts are expressed in the respective currency of denomination.

⁵ Bank loans for which the country of the borrower is unallocated are included in global credit to non-residents.

⁶ Between 2010 Q1 and 2015 Q3, the global US dollar aggregate includes 80% of overseas loans from the People's Bank of China's *Sources & uses of credit funds of financial institutions (in foreign currency)* table.

For (global and regional) local loans in foreign currency (*llfx*), LBS reported local loans (*rllfx*) are supplemented with national data (*ndllfx*), an estimate for non-reporting countries (*nonreplllfx*) and an estimate for newly reporting countries (*newreplllfx*).

$$llfx_{i,c,t} = rllfx_{i,c,t} + ndllfx_{i,c,t} + nonreplllfx_{i,c,t} + newreplllfx_{i,c,t} \quad (6)$$

where *rllfx* = LBS reported local loans;

ndllfx = national data on local loans. This only applies to US dollar loans in Argentina and China, see below;

nonreplllfx = estimated local loans, proxied by cross-border loans to banks of non-reporting economies and economies not reporting local loans in the LBS;

newreplllfx = estimated local loans for new reporters (ie countries that started reporting after 2000) for the period before they started reporting. The estimates are obtained by multiplying cross-border loans to banks by the minimum of (i) the average ratio for the first four reported quarters of local loans to non-banks to cross-border loans to banks and (ii) 1.00. Thus, if the above ratio exceeds 1.00, the new reporter estimate follows the same methodology as the non-reporter estimate.

The *llfx* component of individual country-level FCC data only includes LBS-reported (*rllfx*) and nationally reported (*ndllfx*) local loans. For Argentina and China, local loans in US dollar are from national data on foreign currency loans and are assumed to be 100% and 80%, respectively, in USD.

3.2 Total credit to residents

Credit to residents in currency *c* is defined as credit to the non-financial sector(s) of the jurisdiction for which currency *c* is the domestic currency. Total credit to residents is taken from the national flow of funds (FoF), then adjusted to exclude credit to resident borrowers in non-domestic currencies (ie cross-border and locally extended loans and outstanding international bonds in foreign currencies). The LBS and IDSS are used to adjust for non-domestic currencies.

$$credit\ to\ residents_{c,t} = credit_{all,t} - lfx_{all-c,t} - dfx_{all-c,t} \quad (7)$$

where *credit* = credit to the non-financial sector in the currency-issuing jurisdiction (from FoF)

lfx = cross-border and locally extended loans to non-banks in foreign currency (from LBS)⁷

dfx = debt securities issued by the non-financial sector in foreign currency (from IDSS)⁸

Tables E2.1–3 also show series on credit to the government, based on national FoF data.

⁷ $lfx_{c,t}$ = loans in all currencies in issuing jurisdiction – loans in own currency in issuing jurisdiction.

⁸ $dfx_{c,t}$ = *ids* in all currencies in issuing jurisdiction – *ids* in own currency in issuing jurisdiction.

4. Annual percentage changes

Annual growth rates are computed by first using exchange rate- and break-adjusted changes to calculate a quarterly growth rate, and then compounding quarterly growth rates over four quarters.

$$Annual\ growth_t = 100 \times \left(\prod_{k=0}^3 \left(\frac{BEC_{t-k}}{AO_{t-k-1}} + 1 \right) - 1 \right) \quad (8)$$

where BEC = break- and exchange rate-adjusted changes
 AO = amount outstanding

This formula isolates changes in outstanding amounts arising from transactions from changes arising from other factors (European Central Bank (2012)). For IDS, adjusted changes refer to the net issuance of debt securities, ie gross issuance minus redemptions.

5. References

Caruana, J (2014): "Global liquidity: where it stands and why it matters", IMFS Distinguished Lecture at Goethe University, Frankfurt, March.

Committee on the Global Financial System (2011): "Global liquidity – concepts, measurement and policy implications", *CGFS Papers*, no 45, December.

Domanski, D, I Fender and P McGuire (2011): "Assessing global liquidity", *BIS Quarterly Review*, December, pp 57–71.

Eickmeier, S, L Gambacorta and B Hofmann (2013): "Understanding global liquidity", *BIS Working Papers*, no 402, February.

European Central Bank (2012): "Index of notional stocks and growth rates", *Manual on MFI balance sheet statistics*, April, pp 126–27.

Annex A: Components of foreign currency credit

Borrower	Currency	IDS	XBL	LLFX	Source for LLFX
Global and regional aggregates	USD	✓	✓	✓	See GLI methodology section 3.1
	EUR	✓	✓	✓	See GLI methodology section 3.1
	JPY	✓	✓	✓	See GLI methodology section 3.1
Argentina	USD	✓	✓	✓	100% of BCRA's loans in FX from Q1 2002 ¹
	EUR	✓	✓	✗	
	JPY	✓	✓	✗	
Brazil	USD	✓	✓	✓	LBS from Q4 2002
	EUR	✓	✓	✓	LBS from Q4 2002
	JPY	✓	✓	✓	LBS from Q4 2002
Chile	USD	✓	✓	✓	LBS from Q4 2002
	EUR	✓	✓	✓	LBS from Q4 2002
	JPY	✓	✓	✓	LBS from Q4 2002
China	USD	✓	✓	✓	80% of PBOC's domestic loans in FX from Q1 2010 ²
	EUR	✓	✓	✗	
	JPY	✓	✓	✗	
Chinese Taipei	USD	✓	✓	✓	LBS from Q4 2000
	EUR	✓	✓	✓	LBS from Q4 2000
	JPY	✓	✓	✓	LBS from Q4 2000
India	USD	✓	✓	✓	LBS from Q4 2001
	EUR	✓	✓	✓	LBS from Q4 2001
	JPY	✓	✓	✓	LBS from Q4 2001
Indonesia	USD	✓	✓	✓	estimated using LBS from Q4 2010, as $LC \text{ to } NB \times \frac{XBC \text{ in } USD}{Total XBC} \times \frac{Total \text{ local loans}}{Total LC}$
	EUR	✓	✓	✗	
	JPY	✓	✓	✗	
Korea	USD	✓	✓	✓	LBS from Q1 2005
	EUR	✓	✓	✓	LBS from Q1 2005
	JPY	✓	✓	✓	LBS from Q1 2005
Malaysia	USD	✓	✓	✗	
	EUR	✓	✓	✗	
	JPY	✓	✓	✗	
Mexico	USD	✓	✓	✓	LBS from Q4 2003
	EUR	✓	✓	✓	LBS from Q4 2005
	JPY	✓	✓	✓	LBS from Q4 2005
Russia	USD	✓	✓	✓	estimated using LBS from Q4 2015, as $LC \text{ to } NB \times \frac{LC \text{ in } USD}{Total LC} \times \frac{Total \text{ local loans}}{Total LC}$
	EUR	✓	✓	✓	estimated using LBS from Q4 2015, as $LC \text{ to } NB \times \frac{LC \text{ in } EUR}{Total LC} \times \frac{Total \text{ local loans}}{Total LC}$
	JPY	✓	✓	✗	
Saudi Arabia	USD	✓	✓	✗	
	EUR	✓	✓	✗	
	JPY	✓	✓	✗	
South Africa	USD	✓	✓	✓	LBS from Q3 2009
	EUR	✓	✓	✓	LBS from Q3 2009
	JPY	✓	✓	✓	LBS from Q3 2009
Turkey	USD	✓	✓	✓	estimated using LBS from Q4 2000, as $LC \text{ to } NB \times \frac{LC \text{ in } USD}{Total LC} \times \frac{Total \text{ local loans}}{Total LC}$
	EUR	✓	✓	✓	estimated using LBS from Q4 2000, as $LC \text{ to } NB \times \frac{LC \text{ in } EUR}{Total LC} \times \frac{Total \text{ local loans}}{Total LC}$
	JPY	✓	✓	✗	

FX = foreign currency; IDS = international debt securities issued by non-banks in the borrowing country; LC = Local claims; LL = local loans; NB = non-bank sector; XBC = cross-border claims; XBL = bank loans from the rest of the world to the non-bank sector of the borrowing country.

¹ Banco Central de la República Argentina, *Bank assets*, loans to non-financial sector in foreign currency. ² People's bank of China, *Sources & Uses of Credit Funds of Financial Institutions (in foreign currency)*, domestic loans.

Annex B: Revisions and breaks

The GLIs are subject to changes arising from revisions to the underlying data as well as changes in compilation methodology. The table below summarises significant revisions and breaks in time series.

GLI	Implementation date	Effective date	Approximate size of revision or break	Explanation
Banks' international claims	Dec 2016	Q4 2015	+ \$1.0 trn	China and Russia started reporting the LBS (see Dec 2016 BIS Quarterly Review)
Credit to non-residents, by currency of denomination	Dec 2016	Q2 2012	– \$160 bn (of which, USD: –\$155 bn)	US revised its reporting population for the LBS (see Oct 2016 statistical release)
Credit to non-residents, by currency of denomination	Feb 2017	Q4 2015	+ \$0.6 trn (of which, USD: +\$0.5 trn)	China and Russia started reporting the LBS (see Dec 2016 BIS Quarterly Review)
Credit to non-residents, by currency of denomination	Feb 2017	Q1 2000	+ \$120 bn (of which, USD: –)	Estimates added for local loans to US residents denominated in EUR and JPY
Credit to non-residents, by currency of denomination	Feb 2017	Q1 2000	–	Currency for amounts in EUR and JPY changed from USD to national currency
Credit to non-residents, by currency of denomination	Sep 2017	Q1 2000	+ \$65 bn (of which, USD: + \$33 bn)	IDS based on all ultimate risk sectors, international markets
Credit to non-residents, by currency of denomination	Sep 2017	Q2 2000–Q4 2009	– \$32 bn (of which, USD: – \$37 bn)	Replaced national data local loan proxy for China with <i>nonreplfx</i> between Q2 2000 and Q4 2009.
Credit to non-residents, by currency of denomination	Sep 2017	Q1 2010–Q3 2015	– \$74 bn (of which, USD: – \$74 bn)	Reallocated national data on Chinese overseas loans from China to the rest of the world.
Credit to non-residents, by currency of denomination	Sep 2017	Q4 2015	– \$365 bn (of which, USD: – \$292 bn)	Excluded national data on overseas loans for China, as these are reported in the LBS as of Q4 2015.

nonreplfx = estimated FX denominated local loans to non-banks, proxied by cross-border loans to banks in China.