

Derivatives statistics: the BIS contribution

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In recent years the BIS has worked to make more information available on derivatives markets and ensure their consistency with other key financial statistics. There are now several datasets published on global derivatives markets, the importance of which has been highlighted by the 2007/08 financial crisis. Data reporting rely on a number of practices, especially as regards the list of derivative instruments, the valuation of contracts, and the consolidation of group-level data. Further enhancements are being implemented to address existing challenges going forward.

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1. Introduction – The financial crisis and the importance of data on derivatives markets

The 2007/08 financial crisis highlighted the importance of ensuring transparency in derivatives markets.² The real exposures of a number of financial and nonfinancial firms was unknown to public authorities. This particularly reflected data deficiencies related to derivatives, esp. the lack of useful and timely information on credit transfer activity and where the associated risks were. The G-20 accordingly requested the IMF and the Financial Stability Board (FSB) to identify the related main data gaps and to provide proposals to address them. These proposals were part of the 20 recommendations of the Data Gaps Initiative (DGI), endorsed by the G-20 Ministers of Finance and Central Bank Governors in 2009.³ This step was followed by annual progress reports to the G-20.⁴

Attention has focussed on information regarding over-the-counter (OTC) derivatives markets, especially credit default swaps (CDS). In particular, global efforts to enhance the existing collection of OTC credit default swap data under the auspices of the BIS were encouraged. The 5th DGI recommendation requested “(...) *the BIS to undertake further work in close cooperation with central banks and regulators on the coverage of statistics on the credit default swap markets for the purpose of improving understanding of risk transfers within this market*”. The BIS was also invited to work on how to reconcile banks’ cross-border exposures, as provided by the BIS consolidated international banking statistics on an “ultimate risk” basis, with information provided by its CDS statistics.

2. Measuring the size (or “amounts”) of OTC markets

The BIS conducts regular surveys of OTC markets that are the primary sources for assessing the size and structure of global derivatives markets and providing internationally consistent information.⁵ These surveys on so-called “amounts outstanding” can help policy makers and market participants to better monitor patterns of activity and exposures in the global financial system.

BIS surveys are conducted among central banks (and a few other authorities) that report the information collected from dealers in their jurisdictions. The national aggregates are then reported to the BIS, which publishes global aggregates. They cover the various segments of the derivatives markets (eg commodity, equity, foreign exchange and interest rate) and have been gradually expanded to cover the CDS market segment. These CDS derivatives, for which the credit event is basically the default of a reference entity,⁶ have become of increasingly source of policy interest and comprise a

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² For an introduction on derivatives, see Federal Reserve Bank of Chicago: *Understanding Derivatives; Markets and Infrastructure*, Financial Markets Group (<https://www.chicagofed.org/publications/understanding-derivatives/index>).

³ IMF and FSB (2009). For an analysis of the DGI initiative, see also Heath (2013).

⁴ See IMF and FSB (2014) for the last progress report.

⁵ See BIS derivatives statistics on <http://www.bis.org/statistics/index.htm>.

⁶ Though in reality this situation of default can be complex to establish/have different implications on contract values.

large range of sometimes complex products (eg single- or multi-name CDS instruments, index products...). In the recent years the BIS has released more information on this market segment, with enhanced country coverage and breakdowns. In 2010, in particular, more granular information was provided on CDS counterparties (eg CCPs, SPVs, Hedge Funds) and on index products (CGFS 2009).

The area of focus is the measurement of the size of OTC derivatives markets, with several indicators. The first is the *notional amounts outstanding*, which is the nominal value of all the deals concluded and not yet settled on the reporting date (one will also refer to the “*open interest*”, ie the total number outstanding of derivative contracts that have not been settled). Take for instance the simplified case of a market involving only two dealers: if dealer D1 has bought a CDS protection (covering the risk of default of entity X) for an amount of 10 from dealer D2,⁷ and sold in another trade the same protection to D2 but for an amount of 20, then the total gross notional amounts will be 30 (10+20). It will also be interesting to look at this notional amount on a net basis with the same counterparty (ie 20-10=10) to have a measure of how exposed D1 is to the risk of default of X. For risk assessment analysis one will typically look for a given institution to the net notional amounts against all its unrelated counterparties as a measure of how exposed the entity can be to a future move of the underlying value of the contract.

But notional information exaggerates the real amounts at risk associated with derivatives: this depends on various elements (esp. on the evolution of the underlying instrument) and is better reflected in the market values of the contracts. For each dealer, one can measure the gross positive (and, respectively, the negative) market value of his/her outstanding contracts: it is the sum of the replacement values of all the contracts that have a gain (respectively a loss) position to this dealer, calculated at current market prices. If the contracts were settled immediately, this value would represent claims on (respectively, liabilities to) the dealer's counterparties. One also defines the *gross market value* as the sum of the absolute values of all open contracts with either positive or negative replacement values. This indicator is “gross” because the dealer's contracts with the same counterparty are not netted. The aggregation provides a measure, comparable across derivatives markets and products, of the potential scale of risk in transactions and of the associated risk transfers occurring between dealers.

However gross market values normally exceed the financial risk supported by economic agents. The reason is that in practice contracts can be netted between a reporting dealer and his/her counterparty if there are legally enforceable bilateral netting agreements. Therefore it is also useful to calculate *gross credit exposures* as gross market values minus amounts netted with the same counterparty, and across all risk categories. This provides a better sense of aggregated dealers' exposures to counterparty credit risk. One can also compute net market values in the same way as gross credit exposures, by restricting the netting to one type of derivative product instead of across all products (this is typically done when analysing the CDS segment).⁸ Lastly, experience suggests that derivatives markets can be highly concentrated with important implications for liquidity and pricing. BIS surveys therefore provide some Herfindahl index-type measure of derivatives market concentration.

BIS OTC amounts surveys cover a wide range of derivatives instruments, such as forward contracts (eg agreement to deliver a specific financial instrument at a given price on a particular date), swaps (eg agreement to exchange payment streams based on a specified notional amount for a given period), various types of options (eg right of its purchaser to buy – and obligation for the writer to sell – a financial instrument at a specified price and up to a specified future date). The BIS OTC amounts statistics are in fact split into two datasets. One is the *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity (amounts outstanding part)*, which is the most comprehensive source of information on the size and structure of derivatives markets conducted every three years. Its coverage, initially limited to 26 countries in 1995, has been progressively expanded, to

⁷ This first trade between D1 and D2 is not double counted (ie only 10 is measured) although it would be reported by both D1 and D2 (see for below for the issue of double counting adjustment).

⁸ One may also wish to take the contracts' collateral into account, because such collateral would offset losses should the counterparty default. Yet this offsetting poses some challenges and it is not considered in the BIS surveys.

53 jurisdictions in 2013, representing data collected from around 1,300 banks and other dealers. This Survey takes a snapshot of the market at a precise data (end-June 2013 for the last one). The second dataset is the *Semiannual survey of OTC derivatives*, which started in June 1998 and involves only 13 jurisdictions. Because of its higher frequency, this semi-annual survey is a key source supporting the regular monitoring of activity in the largest OTC derivatives markets.

These triennial and semi-annual surveys are closely linked. They provide the same type of information on the size (eg notional amounts outstanding, gross market values) of derivatives positions, for the same types of contracts. But, by definition, the Triennial Survey provides more comprehensive information esp. in three areas. First, and obviously, on the size and structure of the smaller OTC derivatives markets not covered by the “lighter” semi-annual survey. Second, the benchmark provided by the Triennial Survey helps to assess the coverage of the semi-annual survey, estimated at about 95% – this share varies across risk categories, being the highest in the credit, equity and interest rate segments (ie close to 100%) and lowest in the commodity and foreign exchange segments (around 90%). This reflects the fact that the semi-annual reporters are mostly specialised in interest rate risk management and based in major financial centres (in contrast to what is observed for FX-linked derivatives). Third, the coverage is not strictly identical: the Triennial Survey captures some OTC instruments not covered by the semiannual survey, in particular credit derivatives other than CDS and a more detailed breakdown of CDS counterparties, while the semi-annual survey provides more detailed information about CDS instruments (eg rating and sector of the underlying reference entity).

A key element is that the Triennial Survey (amounts part) and the semiannual survey both cover the worldwide consolidated positions of reporting dealers. They include the information reported by all the worldwide affiliates (ie the branches and majority-owned subsidiaries) of the head offices located in the reporting countries. This has several important implications. First it explains why the coverage of the global market by the semi-annual survey is quite good, despite what the limited number of reporting jurisdictions (13 versus 53) may suggest. The reason is that the financial institutions of the 13 jurisdictions participating in the semi-annual survey control a large number of affiliates over the world and report a very large part of the market activity that is located outside these jurisdictions. The second implication is that operations between affiliates of the same institution are excluded from the reporting: for instance hedging operations conducted by a local branch with its parent entity, which merely reflects intra-group risk management practices, are excluded.

3. Measuring the activity (or “turnover”) in OTC markets

The BIS also conduct another so-called “Triennial Survey” to measure turnover in derivatives transactions. This *Triennial Survey/turnover part* is organised every three years to cover the evolution observed during the month of April (the Triennial Survey’s amounts are measured as of end-June).⁹ The turnover survey part thus provides a measure of market activity, and to some extent of its liquidity. Turnover is defined as the gross value of all transactions (measured by the notional amounts of the contracts) entered into during a given period (regardless of whether delivery or settlement is made during this period), and presented as daily averages. So it is a “flow” indicator, in contrast to the “positions data” provided at a point in time by the surveys on outstanding amounts. The information provides a split between local and cross-border transactions, so as to allow an estimation of the size of local turnover (ie when both counterparties reside in the same country) versus cross-border activity.

This turnover survey first covers activity in the foreign exchange market at large – including spot transactions, whose collection started earlier (in 1986, with a coordination role by the BIS since 1989), and not just FX derivatives instruments. It therefore provides comprehensive information on all FX transactions in general: eg turnover by currencies and currency pairs, counterparty sector, and the geographical distribution of FX market activity. This information is provided for the different types of FX-related derivatives, in particular, FX swaps, currency swaps, outright forwards and FX options,

⁹ Another complexity is that the parts of these surveys are “governed” by two bodies representing the central banking community: the Markets Committee of central banks and the Committee on the Global Financial System (CGFS).

and with some information on the maturity of these instruments. The use of derivatives instruments is also detailed for the 24 most widely traded currencies: for instance derivatives represented in 2013 50% of all FX transactions in Yen, but more than 80% for the Danish krone.

The second major type of information relates to turnover for interest rate derivatives, by instruments: forward rate agreements or FRAs, swaps – the most actively traded interest rate instruments – and options. The information is broken down by counterparty sector, major currencies, and a geographical distribution by country (with UK being the main financial centre trading). The interest rate derivatives category is restricted to those contracts exposed to only one currency's interest rate. Thus it excludes contracts involving the exchange of one or more foreign currencies or whose predominant risk characteristic is foreign exchange risk (and which are reported as FX derivatives contracts, cf above).

A key element is that the trades are collected from sales desks on an unconsolidated basis, ie at the level of the location of the sales desk (even if the deals entered are booked in an office in another location). It therefore provides information on the geographical location of the selling of derivatives products. But it differs with the (consolidated) Triennial/amounts and the semiannual surveys.

4. OTC versus trades in organised exchanges

Yet a last data collected by the BIS are its *Exchange traded derivatives statistics*. These statistics have been compiled since 1986 and are derived from various market sources (with the BIS basically converting number of contracts into notional amounts). They cover both the turnover and the amount outstanding (with both the number of contracts and their notional amounts) of derivatives instruments (futures and options) traded on organised exchanges. BIS calculations allows for aggregating detailed contract-level information according to specific criteria such as market risks categories, instrument types (interest rate, currency, equity index) and location of trade by region.¹⁰

The data are updated every quarter, and published relatively rapidly, so they can be particularly useful for monitoring the international derivatives market activity. However the coverage is limited to organised exchanges and does not comprise OTC information (for which information has to be collected directly from dealers, as done with the BIS OTC surveys described above). This is clearly an important limitation as many derivative instruments are generally not traded on organised exchanges, the main reason being that their contractual terms are not standardised. For instance, while in 2013 daily trading in FX derivatives accounted for more than 60% of FX market turnover (the rest being spot transactions), the vast majority of this trading was conducted over the counter.

5. Statistical issues related to derivatives statistics

One problem with turnover data is *double-counting*: transactions between two reporting entities are recorded by each of them, ie twice: these are “gross turnover figures”. The first step is to ensure the adequate identification of the counterparty as a reporting or a non-reporting dealer. To measure overall market size adequately requires halving the data on transactions between reporting dealers, and therefore to be able to ask all reporters to distinguish between deals contracted with other reporters of the surveys, and those with non-reporters. This inter-dealer double-counting adjustment can be done both at the level of the local deals (ie with other reporters in the same jurisdictions), and for cross-border deals if the other reporters are located in one of the reporting jurisdictions; this is referred to as “net-net basis” (“net-gross” being the adjustment for only local inter-dealer double-counting). Obviously these statistical corrections are prone to errors and omissions.

Another issue is the *identification of “related party transactions”*, ie those between desks and the main offices, or those between affiliates of the same group, either in the same country or across border. Such transactions are by definition excluded from the Triennial/amounts survey and the semi-annual survey, because they are conducted on a consolidated basis. But they have to be reported in the

¹⁰ For an overview of the latest changes in BIS compilation of these statistics, see the *Introduction to BIS statistics* in the *BIS Quarterly Review*, September 2015.

Triennial/turnover part, with the exception of trades conducted to facilitate internal book-keeping and internal risk management within a reporter dealer. In practice this can also be challenging to identify.

A third issue is how to *differentiate among transaction* types (eg purchases and sales of the same instruments are added to calculate turnover data), their valuation (transactions are usually reported in USD-equivalent terms, so the data have to be adjusted for exchange rate movements to have a view of the underlying activity in the market), and the taking into consideration of netting arrangements.

A fourth issue is *financial innovation*, as new “exotic products” constantly emerge. As stated above this underlines the importance of measuring OTC activity, because organised exchanges deal with more standardised instruments. Yet it can also be difficult for the reporting of OTC derivatives especially when instruments cannot be easily decomposed in “plain vanilla” instruments. BIS practice is then to include them in the “other products” category, but this adds a further degree of uncertainty.

Yet a last issue is the *identification of counterparties*. BIS surveys provide information on the sector of the counterparty trading with the reporting institutions. The aim is to identify from reporting dealers the “other financial institutions”. These comprise non-reporting banks and real money investors or so-called “end-users” (eg insurance companies, non-financial customers). Anecdotal evidence suggests that some (non-bank financial) entities may be more involved in derivatives markets than what aggregate statistics suggest. One reason is that they may not be formally allowed to engage directly in derivatives transactions and may instead do so through affiliates. Another point is the difficult identification of specific financial institutions (eg hedge funds) and of their role in derivatives trading.

One possible solution could be to access *greater granular data*. Public authorities have already started the Legal Entity Identifier (LEI) initiative¹¹ which is designed to create a global reference data system that uniquely identifies every legal entity or structure. This will in particular allow for a better identification of the counterparties involved. Public authorities are also reflecting on whether this should be complemented by a Unique product identifier and a Unique transaction identifier as to better capture the specific instrument and the specific transaction taking place. Such a granularity would certainly help to better deal with the issues underlined above: the ongoing push to report to trade repositories (TRs) and code standardization would enhance the quality of OTC derivatives data and facilitate their aggregation at a global level. However, the price to pay – apart from the presumably large resource implications – is to have to cope with a huge amount of detailed information with the risk of getting caught up in granular details and being unable to “see the forest for the trees”.

6. Conclusion – Some statistical challenges going forward

An important development since the 2007/08 crisis is the recommendation for OTC derivatives transactions to be centrally cleared via *central counterparties* (CCPs). A CCP acts as an entity between two counterparties, becoming the buyer (resp. seller) for every sellers (resp. every buyers). When a contract is cleared by a CCP, there is an operation called “novation”. This consists in replacing the initial contract by two new contracts: one between each of the two counterparties and the CCP. So when contracts are cleared through CCPs the notional amounts being reported automatically increase as one contract becomes two contracts. This reflects objective developments in the number of contracts and counterparty risk (since CCPs are also subject to credit risk, at least potentially). But it also means that the requirement for CCP clearing leads to an “artificial” increase in the estimated size of the derivatives market based on outstanding amounts. Moreover, a CCP is by nature more on the radar screen of public authorities, suggesting that the counterparty risk entailed in transmitting risk is limited. Hence the increase in activity due to novation may overstate the real transfer of underlying risks; instead, one may wish to count only one single contract despite the novation operation.

At the same time, CCP can have an opposite effects on the statistical measures of the activity in derivatives markets though the “compression” of trades to eliminate redundant contracts – aiming at terminating derivatives trades in advance without changing each traders’ net position. The increased

¹¹ See <http://www.leiroc.org/>.

usage of CCPs seems to have facilitated such trade compression in recent years, having a downward effect on the number of contracts and thereby on the size of the market (all other things being equal). The CCP issues are just one example of how regulatory reforms can affect the measurement of derivatives markets. Another example is *banking regulation*, and its possible impact on banks' proprietary trading activities and commissioned business (ie derivatives trading on behalf of third parties and not in the own names of the reporters).

Another issue is the *consistency of approaches* regarding the assessment of derivatives transactions. Particular attention is being put on the consistency between the related datasets, especially regarding the differences between statisticians' and regulators' approaches, as well as across institutions and jurisdictions. As regards regulation, for instance, the Asian crisis showed that banks had exposures via derivatives that were not captured in "traditional" approaches focussing on the intermediate counterparty risk (which mainly focus on the borrower's situation). As a result the concept of ultimate risk has been developed (CGFS, 2000) in order to better capture the risk transfers from one entity to another counterparty, for instance due to derivatives positions, collateral, the provision of guarantees, etc. This concept allows for a better understanding of the creditor exposure and how it is moving across sector and country (Mc Guire and Wooldridge, 2005). Further consistency between supervisory data and derivatives statistics has been sought since the 2007/08 financial crisis. Nevertheless, bank's internal measures of risk can use varying methodologies. While the usual practice is for derivatives to be held off balance sheets while their market values are recorded on balance sheet, accounting standards (eg IFRS vs national GAAPs) may have different implications. The treatment or repurchases agreements and securities lending arrangements (for which the risk should be reported as transferred to the collateral) are not identical across jurisdictions. More generally, netting standards and practices (eg with the same legal entity or not), collateral treatments (eg cash versus non-cash), and guarantee regimes (in terms of whether they are explicit, irrevocable, liquid and readily realisable) can vary across countries and entities. In particular, there are different degrees of commitments, from legally enforceable ones to those that are assumed say for reputation issues. All in all this complicates the identification of counterparties and the assessment of underlying exposures.

In addition, the *transfer of risk* to another agent may have a different economic implication: for instance if a firm has an exposure on an initial counterparty which is transferred to a second counterparty through a guarantee, it will suffer a loss if both the initial counterparty and the guarantor fail. The probability of this "double" event is lower than the one for the sole default of the initial counterparty. But the statistics will capture a risk exposure that is the same in terms of amount at risk. Attention has also focussed on *consolidation* (cf IAG, 2015). As argued above, it can be interesting to look at the derivatives market on a consolidated basis, as this is done with the BIS OTC surveys. This typically assumes that the parent company will ultimately bear the risk taken by its affiliates; to what extent this will be the case in reality when financial stress occurs remains to be seen, especially when no formal guarantees have been established. The treatment of banks' non-bank affiliates and the consolidation perimeter when corporate groups' structures are complex provide additional challenges.

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