Micro data for monetary policy implementation – recent experience in the ECB

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By U. Bindseil, M. Corsi, P. Nicoloso, F. Rodríguez, I. Segura

1. Introduction: recent trends and changes in MPI which make micro data more relevant

Monetary macroeconomics and conventional monetary policy decision making can in theory be imagined as an activity not requiring any micro-data: macroeconomic data is being collected and analysed to derive from it the adequate stance of monetary policy as captured in a target for the short term interest rate. In contrast, monetary policy implementation has always relied on, and has always produced, significant amounts of micro-data. Implementing monetary policy normally means controlling through central bank market operations the short-term interbank interest rate. In crisis times, additional operational targets are pursued beyond the short term interest rate, such as e.g. "purchasing every month an amount x of set y of eligible securities", or targeting some interest rate other than the short term risk free rate. Monetary policy is being implemented, i.e. becomes real through financial operations of the central bank with the rest of the world – and in particular with financial institutions. "Signalling" or "open mouth operations" of central banks are only relevant if they affect expectations regarding actual financial market operations. Unavoidably, monetary policy implementation does not take place in the aggregate, but transaction-by-transaction. Relying on actual financial market operations, monetary policy implementation is by definition a microeconomic activity. In particular the following types of micro-data are relevant for monetary policy operations:

- **Eligibility data**: Monetary policy operations are conducted with eligible counterparties and involve the pledging or purchases of eligible assets, i.e. mostly securities. Eligibility of counterparties and of assets needs to be established on the basis of objective criteria, including e.g. formal institutional criteria, credit quality indicators, and in principle any further criteria that are deemed relevant. Data to establish the fulfilment of criteria needs to be collected, checked and stored. Processes and data quality needs to be such as to ensure equal treatment, auditability and accountability. As the fulfilment of relevant eligibility criteria can in principle change at any time (e.g. credit quality can deteriorate), the relevant input data needs to be monitored and updated when needed, following well defined and resilient procedures.

- **Data on risk management parameters applying to counterparties and assets**. Establishing eligibility is a first step – but typically specific risk control measures are associated with each counterparty and eligible asset. For assets in outright purchase programmes, limits apply (issue share or issuer share limits, or absolute limits). For each asset eligible for pledging, a certain haircut is fixed, which moreover can vary depending on whether the pledged collateral has some link to the counterparty or not.

- **Non-static financial market data supporting eligibility, valuation and risk control**. Market prices or turnover data can be relevant input to both eligibility and risk control parameters. Moreover, central banks need to value eligible assets for risk control and accounting purposes. Therefore, market price data is typically collected at some frequency for all eligible securities. Moreover, data is collected for the theoretical valuation of assets for which no market price of sufficient quality can be collected.

- **Transaction data** (including collateral use). Monetary policy is implemented through actual financial transactions. Each financial transaction is captured in a data record, including price, counterparty, volume, time, context, and complementing information (such as for outright purchases, e.g. the non-winning second and third best quotation obtained). In the case of secured credit operations, also the posting and withdrawing of collateral from collateral pools can be recorded as financial transaction (or at least the end of day collateral pools constitute a relevant data set on their own).

- **Market data to understand market conditions and the achievement of the operational objectives of monetary policy implementation.** Monetary policy implementation aims at controlling certain financial market variable(s) such as the short term risk free interest rate. Therefore to allow monitoring the effectiveness of monetary policy implementation across time, the relevant market prices need to be measured, stored and accessed. While in some markets, the measurement of a price may be obvious (e.g. the marginal price of a security in an auction taking place in a regulated market), in other, decentralised matching markets ("OTC" markets), such as the traditional interbank money market, measurement of a single price is less obvious and may require the set-up of a specific collection process of granular transaction data from the relevant market participants. Furthermore, market data needs to be collected and analysed for understanding market developments, in particular in case of imperfectly functioning markets.

- **Data for investment operations. Central banks conduct market operations also outside the implementation of monetary policy, namely for investment purposes (including foreign reserves management) and as provider of reserve management services to foreign central banks or Governments.** This again includes similar data types as for monetary policy operations. In addition, investment operations typically focus on performance measurement and attribution, creating further data categories.

While it can therefore be concluded that monetary policy implementation and more generally central bank market operations has always been micro-data intensive, it seems also true that the role and importance of micro-data has further increased over the last years for a variety of reasons. Consider the key reasons one by one.

- **More developed financial markets with a higher number of eligible instruments and counterparties**. Central banks (or at least some of them, such as the ECB) aim at broad based eligibility for the sake of effectiveness of monetary policy implementation, equal access, and possibly financial stability. Financial markets have become more differentiated and sophisticated over time, which also tends to increase related micro-data volumes.

- **More sophisticated and ambitious eligibility criteria and risk control measures**. Generally, risk management has been refined considerably over the last years, including the idea to not rely "blindly" on rating agencies. The refinement and internalisation of risk management implies the need for significant amounts of additional micro-data.

- **Higher auditability requirements**. Today, auditability of all central bank operations has become a standard requirement, similarly to developments in private financial institutions.

Auditability relies on data records of sufficient detail and quality to be stored for the relevant period of times. The object of audits is typically the compliance with the rule books endorsed at various levels of the central bank organisation. Therefore, the rule books also define the requirements to store, and the quality control procedures of the data on central bank market operations.

- **More need for high quality data in view of higher central bank public scrutiny and transparency**. With the increasing roles of central banks, also media attention on central banks has grown, including critical central bank watching. The response of central banks to this development has often been to aim at more transparency and acknowledge its accountability, both of which however require the availability of high quality data that withstands public scrutiny and allows to validate the central banks' communication policy.

- **More demand for data for internal and external economic research**. It has become more standard for central banking to provide data to researchers, including in the domain of central bank market operations. Research is done both internally and externally. Internal analysis and research typically serves an improvement or refinement of policy measures and their execution. In some cases, internal research also leads to publications (e.g. as an economic bulletin article, or as a working paper). Moreover, central banks are in principle willing to make micro market and market operations data also available to the public including external researchers, although micro data often is of a confidential nature. In this case, anonymization of micro data may be a solution to allow for the data being used by external researchers. Alternatively, external researchers might temporarily work within the central bank and be subject to the same confidentiality requirements as staff members. In any case, the use of micro data for analysis and research of monetary policy operations requires high quality historical market operations data to be stored in such a way that it is accessible to eligible users.

- **Financial crisis causing market fragmentation and hence the need to have a more granular perspective on financial market data**. In thin and/or fragmented financial markets, it is no longer sufficient to observe and collect one single price and volume time series for a certain asset, but instead it becomes necessary to collect granular data across the fragmented market to be able to form a judgement of where market conditions are in terms of (i) their role for the monetary policy transmission process (ii) what they imply for how the central bank can achieve its operational targets of monetary policy.

- **Better means to collect and store data thanks to modern IT systems**. The means to store data have improved enormously over the last years and decades. This "supply" factor, in combination with the "demand" factors listed above, jointly have led to an ever increasing importance of micro data storage in the market operations domain.

To provide further illustration, the rest of this paper will review in more detail some selected aspects of the current use and trends in the micro-data use for market operations in the ECB. Section 2 will review developments in the area of money markets, section 3 will turn to collateral eligibility and use, and section 4 will cover micro-data in the context of the Eurosystem asset purchase programmes.

2. Micro-data data on money markets

Money markets are the natural starting point for the transmission of policy rates to the real economy. The transmission originates in the overnight interbank market, where traditionally excesses or shortages of liquidity are addressed by short term lending operations between banks. Pre-crisis, term premia were mainly reflecting future policy rates expectations, while liquidity and risk premia were deemed negligible. Since the crisis, this has changed: risk premia have become much larger, causing a significant price differentiation between actors of the money markets despite the large aggregate amounts of excess liquidity. Therefore now even overnight rates in interbank markets trade in wide ranges every day, and sometimes even beyond the ECB corridor when banks have no access to Eurosystem standing facilities. Beyond the price differences, such dispersion typically also contains information on market access: the banks paying high rates are also, usually, those having a more limited market access and a higher recourse to ECB refinancing operations. In this context, just looking up a single reference rate, though it remains useful, provides an incomplete and overly simplistic picture of the money market. Only parts of the secured market are really homogeneous where collateralisation and the usage of Central Clearing Counterparties allows to reduce the impact of credit risk premia on pricing, or in forward markets like OIS. However these benefits are tangible only for those entities that are members of these market infrastructures. Therefore, the recourse to money market micro-data becomes a necessary condition to understand actual funding costs and access of banks, and therefore to understand the starting point of monetary policy transmission.

The ECB has collected micro-data on money markets until this year via the so-called Euro Money Market Survey (EMMS). This annual micro data collection is made of contributions from around 150 reporting banks across the European Union, split across instruments and maturities. The published report only shows aggregate data. Rate information has never been in the scope of this data collection. Despite this shortcoming, the EMMS could provide evidence of the local bias that was observed during the financial and sovereign debt crisis, whereby significant retrenchments to the *domestic* counterparties could be observed in unsecured markets. For example, banks were taking less and less counterparty risk with peer banks located in other euro area countries as credit risk departments were reducing or cutting to nil risk budgets. Quickly, banking systems in some jurisdictions lost access to unsecured funding markets during the years 2011-2012. Repo markets remained partially open, but "wrong way risk", i.e. the use of correlated collateral, was seen more and more critically by cash providers. These developments could be understood as indeed banks reported turnover information with breakdowns by counterparty residence and collateral issuer location. A useful element of the EMMS was also the collection of qualitative comments by reporting banks, both in the quarterly and in the annual surveys. Overall this proved a very useful source of market information in particularly in troubled times.

The EMMS, which as a voluntary data collection exercise, is now replaced with the Money Market Statistical Reporting pursuant to a Regulation, which text was published by the European Commission in November 2014 – and recast in September 2015 for minor updates. The MMSR allows the collection of trade-by-trade, granular data, where not only aggregated turnover but full trade details (maturity date, rate, counterparty, collateral details, forward points) are sent to us by the selected reporting banks (52 banks so far) in four segments: secured, unsecured, FX swaps and OIS. This "big data" gives, every day, the details of the trades conducted the previous day by the reporting banks. The MMSR collection started on 1 April 2016 and is being progressively phased -in. So far around 25,000 trades per day are received whereas not all banks are reporting all the segments daily yet. From 1 July onwards, the daily official reporting obligation in the four segments starts. The MMSR will from then on become the instrument of choice to study and better

understand market dynamics, and how market pricing differentiation influences participation to policy operations.

The MMSR data collection is the result of a European-wide cooperation. Even if this is an ECB project, NCBs are closely associated to the data collection, in two main ways: First, the NCBs in the four largest countries (Germany, France, Italy, Spain) directly collect the data of the reporting agents located in their country and pass them onto the Transactional Module; Second, the Transactional Module, collecting all bank data coming from the four largest NCBs and from the banks that report directly to the ECB, is powered by Banque de France on behalf of ECB.

The reporting chain is overall relatively complex, as after those initial steps, data are enriched and then passed onto the Analytical Module where users in the Eurosystem can see the final data, run aggregations and reports. Such a complex mechanism relies in part on existing reporting infrastructures among NCBs, which minimised the costs for the Eurosystem at least to a certain extent. It also requires specific and rigid reporting requirements. At the same time, the Eurosystem was faced with a certain fatigue of banks to provide yet another data set to another public entity, also because of various similar but not identical requests by other public authorities. The Eurosystem turned this challenge into an opportunity by applying and developing an ISO standard as a reporting format, which had never been done before. This format pioneered by the ECB has been re-used by the Bank of England for its Sterling Data Collection (the UK equivalent of the MMSR), and the Securities Financing Data Store as well will use the ISO format for reporting secured transactions. Overall this allows the industry to use several times the same or very similar files, thereby reducing the reporting burden and increasing its acceptability. The Regulation also mentions that from January 2017 onwards, a second wave of reporting agents can be selected. This second wave will allow achieving the full European dimension of the MMSR. Indeed the 52 reporting agents selected in the first wave are representing a subset of the euro area countries, i.e. that not all countries are covered yet. Similarly, significant money market players are not covered either, due to the usage of the balance sheet size as an exclusive selection criterion for the first wave. Therefore, the second wave will allow a much more extensive coverage of the money market activity, both from a geographical and systemic point of view.

The extension to new reporting agents in the second wave will be challenging on three aspects: (i) Communicating, explaining and testing the reporting framework with a potentially larger number of smaller institutions will pose organisational challenges; (ii) Handling a large number of smaller operations will require increased system capacity; (iii) Resourcing the data collection and analysis will become more challenging, both on the statistical and from the business side.

This MMSR data collection will benefit the public in several ways. First, it can be expected that the improved knowledge of money markets will be helpful for the conduct of monetary policy, which is a public good. It will also contribute to the better understanding of financial stability issues, as the data can provide evidence of market fragmentation issues and of the activity levels of the various segments of money markets across time. Moreover, the ECB would publish on its website new type of information compared to the former EMMS, and at a higher frequency[1]. It is planned to release information on aggregated volumes and rates, distributed per market segments and maturities for every reserve maintenance period, hence with a frequency of around every 6 to 8 weeks. It is also planned to release additional information on a quarterly basis for instance on collateral or CCP usage. In any case, only aggregated data would be published due to the confidential nature of the granular information. The data collection has started officially on 1 July 2016 (previously data collection was for testing purposes). The timing of the initial data release will depend on the experience gained and how quickly the reported transactions data will be of a sufficient quality. At a

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[1] The EMMS was published annually.

later stage, the Money Market Study, based on MMSR data instead of EMMS data, will continue to be published, allowing an even better insight. Therefore and apart from the current transition period during which teams are busy with data quality and system controls, future MMSR data publications will be released with a higher frequency and will contain significant additional information.

3. Micro-data on collateral eligibility and use

All Eurosystem credit operations need to be based on adequate collateral, as defined by Article 18.1 of the Statute of the ESCB. Such adequacy entails two dimensions: sufficient availability of collateral to a broad set of counterparties and protection from losses. To meet these requirements, the Eurosystem established a single framework[2] defining the criteria for eligibility of collateral to central bank credit operations and introduced risk control measures calibrated to bring the exposure of the Eurosystem to acceptable levels. Moreover, the global financial crisis highlighted how collateral frameworks need to be dynamic to ensure the proper implementation of monetary policy. In the last decade, the Eurosystem therefore altered and expanded the eligibility criteria for collateral, either by means of temporary measures or by implementing changes to the standard collateral framework.

Collateral availability if not an issue that can be understood at an aggregate level, as collateral scarcity is a phenomenon that will materialise at the individual bank level. For example, while there is no doubt that banks have sufficient eligible collateral in their balance sheets *on aggregate* (holdings of eligible collateral by banks exceed the total liquidity deficit of the banking system vis-à-vis the central bank by at least a factor of 10), one has also observed various cases of individual banks running out of standard collateral over the last years and being in need to take recourse to emergency liquidity assistance (ELA). Banks who feel that they may run out of collateral will not be particularly willing to provide new credit to the economy, i.e. risks of insufficient collateral will therefore easily interfere with the smooth transmission of monetary policy. Therefore, understanding collateral availability at the micro-level is important for monetary policy implementation and for understanding the transmission of monetary policy. Obviously, micro-data on collateral use is not only relevant for analytical purposes, but also relevant for monitoring compliance of banks with the relevant rules (e.g. close-link prohibition, limits on the share of bank bonds issued by one issuer group in a collateral portfolio).

The two main IT systems dealing with the collateral management at the ECB are the Counterparty and Collateral Database (C2D) and the Market Operations Database (MOPDB). C2D is the main ESCB system for transmitting and storing data on eligible assets (EA), their use as collateral (UC) and data on monetary policy eligible counterparties (MPEC). MOPDB is an ECB internal database used for analytical purposes and containing collateral and counterparties data, among other operational or market data, e.g. tender participation data or data related to asset purchases.

The EA dataset consists of marketable assets, identified by the ISIN code or another registration number and providing information on the nominal value outstanding. Each reported field provides information which is relevant either for determining eligibility and/or computing risk control measures. Each record contains information on asset characteristics (e.g. denomination, coupon, liquidity class, issuance and maturity date, reference market), issuer and, potentially, guarantor characteristics (e.g. group, residence, central securities depositories) and valuation haircuts. In addition to these fields, which the ECB publishes daily on its website, the EA *internal* dataset

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[2] On 1 January 2007 a single framework applicable to all Eurosystem credit operations (the "Single list") replaced the two-tier system that had been in place since the start of Stage Three of Economic and Monetary Union.

contains information on asset, issuer and guarantor ratings well as relevant information for more complex assets, such as ABSs and covered bonds. As of June 2016, each reporting date accounts for some 32,000 records (assets). The UC dataset reports pledged marketable and non-marketable assets. Each record reports an asset, identified by the ISIN code or another registration number, and the counterparty pledging the collateral, as well as the nominal amount submitted and the collateral value before and after haircuts. Moreover, each record contains information on collateral system type (pooling or earmarking), whether the use of collateral is domestic or cross-border, the mobilisation channel and related securities settlement systems (for marketable assets). In addition, non-marketable assets report granular information on debtors of eligible credit claims and information related to the credit quality assessment other than that reported to the EA. As of June 2016, each reporting date accounts for some 200,000 records.

The MPEC dataset reports information on counterparties' eligibility to each type of open market operation and standing facility, as well as whether institutions are subject to reserve requirements. As of June 2016, the MPEC universe consists of some 5,200 entities.

National central banks (NCBs) report eligible asset data to C2D on a daily basis, data on the use of collateral on a weekly basis and data on eligible counterparties on a continuous basis. The system receives the dataflow, performs validity, consistency and eligibility and usage rules checks, asks for possible data revisions and disseminates the final clean Eurosystem data back to the NCBs. Clean datasets are also replicated to MOPDB for the ECB's (and indirectly the Eurosystem's) monitoring and analysis. As regards dissemination to external parties, granular data on eligible assets are published on the ECB website on a daily basis, aggregated data on use of collateral on a quarterly basis and granular MPEC data (information on institutions subject to reserve requirements) with a monthly frequency. In addition to the ex-ante validity, consistency and eligibility and usage rules checks embedded in the database, C2D data quality is ensured through an ex-post semi-annual exercise which checks for residual inconsistencies within the database and between C2D and other sources (e.g. rating agencies data, CSDB[3]). Final results are included in a data quality report submitted to the Governing Council.

C2D benefits from the interaction with other Eurosystem and ECB databases in order to implement its eligibility criteria and performs the required validity checks. Specifically, it is linked to databases providing information on liquidity operations and standing facilities, ratings, asset prices and exchange rates as well as institutions (this latter relevant, in particular, to assess the existence of close links among counterparties and institutions which issue or guarantee collateral). Hence, both in the development and maintenance phase of the database a high degree of coordination and cooperation among different systems is required. Overall, the successful implementation of the system relies on a continuous interaction between the business area dealing with collateral and counterparty management and those dealing with the IT development of the application. Moreover, collateral information can be related for analytical purposes to statistics on securities holdings, e.g. in assessing how much eligible collateral credit institutions hold in addition to the collateral posted. The dataset on securities holdings statistics (SHS) provides granular information about holdings of individual securities (identified by ISIN) by country and sector of the investor. Overall, these data are not only used in the context of collateral management but also of other areas related to monetary policy implementation, for example in monitoring purchase limits related to outright purchases or assessing portfolio rebalancing effects deriving from the purchases under asset purchase programmes.

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[3] The Centralised Securities Database (CSDB), including its rating module, contains market information on individual securities relevant for the statistical purposes of the European System of Central Banks (ESCB).

Since the start of the global financial crisis, the fast-paced evolution of the collateral framework has been translating in intensive development of the related IT systems to cater for the increased complexity of the framework, keep ensuring state-of-the-art data quality and achieving efficiency gains based on economies of learning, as well as providing timely and transparent information to the public. The main challenge lies in the adaptation of the existent data structures and flows to the additional asset classes accepted as collateral (and related incremental or modified data fields on the basis of required information on asset characteristics). In addition, the impact of periodical reviews of risk control measures needs to be reflected in a timely manner in the collateral database. Finally, lead times to develop the most suited data solution could be demanding owing to the expected timeline of the implementation of the decided monetary policy measures. Looking ahead, the evolution of collateral data will largely depend on the monetary policy decisions on the collateral framework and the related risk control measures. While more fundamental innovations in the framework are expected to require higher effort in terms of data adaptation and development, moving towards lower collateral complexity or non-fundamental reviews in valuation practices would not demand major overhaul thanks to built-in functions which would allow modifying or de-activating specific requirements.

The Eurosystem collateral and counterparty data has been used for numerous publications. Descriptive statistics on eligible collateral and use of collateral are a standard part of the ECB Annual report, and were furthermore presented in several Economic Bulletin articles together with analysis based on granular data, for example the articles "The collateral frameworks of the Federal Reserve System, the Bank of Japan and the Eurosystem" (October 2007) and "The Eurosystem collateral framework throughout the crisis" (July 2013). Moreover, granular collateral data was used for several analyses included in the CGFS paper entitled "Central bank operating frameworks and collateral markets." (BIS, March 2015). Finally, researchers analysed and modelled collateral data to test specific hypotheses. Cassola and Koulisher (2015) estimate a model to quantify how changes in haircuts affect the collateral used by banks and conclude that a 5% increase in haircuts applied to collateral belonging to a specific asset class would reduce the use of the asset class with higher haircut by around 15%. In the context of analysing the impact of Basel III measures on banks' behaviour in the Eurosystem monetary policy operations, Bucalossi et al. (2016) use collateral data to highlight the change in collateral composition in terms of liquidity categories.

4. Micro-data on implementation of asset purchase programmes

Currently, the ECB purchases every month EUR 80 billion of securities in the context of its Asset Purchase Programme (APP). The APP includes purchases of public securities ("PSPP"), covered bonds ("CBPP3"), asset backed securities (ABSPP) and since June 2016 corporate bonds (CSPP). It is one of the largest and most complex and diverse purchase programmes ever conducted by a central bank[4].

Comprehensive micro-data on securities is needed already in the design phase of a central bank asset purchase programme. An eligible investment universe needs to be precisely identified. Apart from its suitability from the perspective of monetary policy objectives, sufficiency of purchasable volumes and market liquidity need to be established. In the case of the Eurosystem, purchase programmes also typically have to fulfil complex matrix architectures with pre-determined volumes NCB by NCB and jurisdiction by jurisdiction. The necessary micro data on securities is typically retrieved from Bloomberg. The starting point of eligibility has often been the ECB collateral framework, and hence the EADB as mentioned in the previous section.

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[4] https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html

The ECB's Treasury Management System (TMS) is used to support the trading, handling and reporting of micro-data related to the APP, including settlement. Prior to the implementation of each program, all eligibility aspects are defined in the system, including: eligible counterparties, predefined issuer and issue limits, as well as securities data; all this information is maintained and updated on a daily basis. Afterwards, trading data is collected in TMS immediately after each trade is conducted. For each transaction, the portfolio manager records the instrument, nominal value, price, counterparty, transaction reference, maturity and settlement dates. This data collection process is done at the ECB level and at each of the participating NCBs. The ECB TMS system functions as a centralize hub for all the programs related information, making it automatically available to all the programs participants and feeding afterwards the SHS system. To facilitate the data analysis and dissemination, several reports are generated and properly disseminated. The reporting is done on a daily basis to ensure that at the end of the month, targets are met by each participant and program.

The execution planning of a purchase programme comprises the coordination of the ECB with the National Central Banks (NCBs) on the daily purchases which are conducted via electronic trading platforms or telephone. The ECB has developed internal applications and analytical tools in order to optimise resources and extract the maximum amount of relevant information from the available market and trading related data. One of the applications, *Saikun*, facilitates the daily bond selection task to portfolio managers by bringing together all the necessary information such as bond prices and constraints in one single place increasing operational resilience and efficiency. Others allow the ECB to track the performance of counterparties and the consistency with which ECB portfolio managers choose counterparties, or to extract daily market liquidity from ECB and NCB trades.

The implementation stage of an asset purchase programme generates a vast quantity of valuable micro-data which is used by the ECB to monitor the implementation of the programs and their effectiveness. As of 10 June 2016, the APP has established positions in 2,500 securities and cumulated 76,000 trades, with a total value of purchased assets of more than EUR 1 trillion[5]. In addition, micro data encompasses eight price indicators (price, yield, spreads to several reference curves, repo rates) for certain securities and counterparty information (trades executed, trades missed, prices shown). Data capture is either event driven (trade information) or collected on a daily basis from other systems. Security data must be captured in a form that is complete enough to reproduce market-relevant pricing transformations (price/yield, price/spread) from securities data.

Recently, data amounts have again steeply increased further with the addition of the Corporate Sector Purchase Program (CSPP). The low average ticket size in the corporate bond markets has increased the total amount of transactions by almost 27% (although the share in total volumes is so far around 7%). The daily average number of transactions of the Eurosystem has increased with the CSPP from around 260 to around 330.

In order to fulfil the regular reporting tasks and monitor the market environment in which the asset purchase programmes are being executed, additional data is collected from trading platform vendors and financial data providers. The data covers the aggregate trading volumes per jurisdiction, liquidity parameters, bond axe information, security specifications and bond prices. Data on liquidity indicators is provided on a daily basis while data on aggregated traded volumes is provided weekly. This data supports reporting to decision-makers. It is analysed for the impact of the purchase programmes on market developments. External data is stored in an in-house relational database and is used to support internal applications, reporting procedures and analytical processes.

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[5] Figures as of 07-Jun-2016 extracted from:
https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html

5. Conclusions

Monetary policy implementation is by definition a "micro-economic" activity, and therefore relies on, and generates significant amounts of micro-data. While this has always been the case, the amount and sophistication of data, and the requirements regarding their quality and storage, have significantly increased over the recent decades, more recently because of the financial crisis and the implied (temporary) decline in market efficiency. Today, large micro-data sets can be stored, accessed, matched and be analysed with a high degree of efficiency, provided the central bank sufficiently invests into the relevant statistical and IT infrastructures. In this paper, we provided a few current examples from the ECB's perspective of micro-data uses in the market operations domain.