Promoting enhanced responsiveness to users' data needs: the experience of the *Banco de Portugal* in exploring the statistical potential of micro-databases

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1. Coping with the "data gaps" issue

The issue of "data gaps" has been attracting an increasing amount of attention in the wake of the financial crisis of 2007-09. Policy-makers, financial supervisors and regulators around the world have been striving to find out which particular indicators were missing that would have helped them, if not to prevent the crisis, at least to mitigate its intensity and to contain its more serious implications within manageable boundaries. Such interest, which typically follows any financial crisis, brought additional pressure on the statistical systems worldwide to expand their reach with a view to covering areas where those data gaps have been more prominent – *e.g.*, information for the purpose of financial stability analysis and systemic risk assessment.

Gathering more and improved information in reaction to data needs revealed by a past crisis is expected to provide superior financial statistics, as well as a better analytical toolkit to the authorities responsible for safeguarding the stability of the financial systems, increasing their levels of preparedness to assess current financial developments, and helping them to avoid the repetition of the same mistakes that had prompted previous crises. A word of caution though: even in the event that, somewhere along the process, we end up having at our disposal what looks like a set of analytical tools of exceptional quality, this does not necessarily imply, of course, that financial crises will be forever avoided. In fact, it is not unusual that indicators designed to describe past or contemporary events fail as early warning indicators of a future crisis. This may happen simply because crises are not all the same; the

determinants of the *next* crises do not have to be replicas of the factors that prompted former ones. What's more, this may lead the unwary into a false sense of security, impairing their ability to identify potential sources of problems right at the earlier stages of the crisis development. Johnston *et al.* (2009) provide evidence about the hidden dangers related to gaps in information content: *"The standard financial soundness indicators that were emphasized as part of the IMF's surveillance generally performed poorly as early warning indicators of the financial turmoil. Some of the core indicators continued to signal soundness and sufficient liquidity of financial institutions even as underlying balance sheet and market conditions deteriorated."*

Clearly, information gaps do not come up only as a result of a financial crisis. To a certain extent, they are an intrinsic, ever-present, feature of conventional data collecting systems. By their very nature, these systems are essentially static, in contrast to the dynamic behaviour of the phenomena they are meant to capture and measure, implying that financial statistics engendered by them tend to lag behind the developments in the financial system, particularly as regards financial innovation. In fact, conventional data collection schemes *"may simply not be consistent with the dynamism of the financial system, particularly in light of the tendency of innovation to continually shift to outside of the areas to which analysis and scrutiny are most directed"* (Palumbo *et al.*, 2010).

Also, conventional data collecting systems cannot simply keep on expanding indefinitely just to cope with the need to fill the data gaps perceived by the users. Amongst the many motives for not pursuing recurrently this approach one could point out, *inter alia*, the following:

▪ The resulting overburdening of respondents goes against established best practices and is "politically" ill-advised.

▪ The related initial and maintenance costs are far from being negligible, both to the agency that collects the data and to the respondents.

▪ New reporting schemes (or significant enhancements to existing ones) take a long time (years, rather than months) to develop and implement and, once launched, are supposed to remain in operation for a lengthened period of time (typically some years, as seems to be the case with Eurosystem statistics). This long time-lag could even be further extended, should the revision result from a major change in the principal methodological manuals, as it is often the case.

In a nutshell, the response given by conventional data collecting systems to new data requirements – stemming from, *e.g.,* the need to conduct macro-prudential analyses – is problematic, costly and could possibly turn out to be counterproductive. This calls for a paradigm shift *(see Figure 1).*

Possibly, the answer *"requires changing the way we use existing data"* (Cecchetti *et al.*, 2010); we should *"use data in a different way – in a way that can deliver more flexibility in targeting than static data collection can allow"* (Palumbo *et al.*, 2010). Central banks already collect and process huge amounts of data. These data, typically aggregate data, if used appropriately, could provide signals of where to look. Referring to broad-based increases in financial leverage and the growth in off-balance sheet items, Constâncio (2010) pointed out that *"it should be recognised that during the crisis signals of imbalances did emerge from aggregated macro-financial data"* – even though *"they failed to attract sufficient attention"*, as he added next.

To illustrate trends and potential anomalies visible in the aggregate data, Costa (2010) suggested that the latter *"must be complemented with a second stage of more-targeted analysis relying on less traditional sources of information"*. *Ad hoc* surveys and the provision of micro-data [1] are good candidates to be considered within this category. However, given that the designing, conducting and

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[1] Throughout the paper the term "micro-data" will be used to refer data about an individual person, household, business or other entity. It may be data directly collected by the central bank or obtained from other sources, such as administrative sources.

processing of *ad hoc* surveys is in general too time-consuming and expensive, not to mention reliant upon the willingness to participate on the part of the target population, centring our attention in the micro-data instead seems to be a more promising approach to the problem.

In fact, statistically edited micro-data, including data from administrative sources not originally intended for statistical purposes or even data related to the prudential supervision function, offer an unusual array of interesting features, *inter alia*:

- Very good coverage of the population (in most cases).
- Relatively low reporting costs.
- Increased flexibility as regards the compilation of new statistics.
- More rapid response to specific (*ad hoc*) data requirements from the users.

Moreover, the evolution in network and communication protocols, database systems and multidimensional analytical systems has somewhat removed the potential disadvantages of having to deal with the huge amounts of data normally associated with the handling of micro-databases.

The *Banco de Portugal* has been using micro-databases and item-by-item reporting for several years now, with a very significant positive impact on the overall quality of its statistical output. Besides complementing and/or cross-checking the information gathered through more conventional channels, these data have proved to be of great importance in monitoring and assessing developments in the Portuguese financial system, especially in the wake of the recent financial crisis.

Figure 1 – Data gaps challenge and micro-data response

In the remainder of the paper we will:

- Describe the micro-databases that the *Banco de Portugal* uses for statistical purposes, and discuss their effectiveness as a means to mitigate data gaps stemming from the recent financial crisis.

- Examine the work ongoing at the *Banco de Portugal* with a view to (i) enhancing the consistency of the information coming from different micro-data sources and (ii) integrating micro- and macroeconomic data in an attempt to get a more complete picture of the performance of the Portuguese economy and of its financial system.

2. Looking at the available micro-data

Over the last decade, the *Banco de Portugal* has been focussing an increasing interest on the field of micro-data (including those from administrative databases and from prudential supervision), both for statistical compilation and for analytical purposes.

The Statistics Department of the *Banco de Portugal* currently manages three main repositories of micro-data, namely:

a. the Securities Statistics Integrated System (SSIS) database;
b. the Central Credit Register (CCR) database; and
c. the Central Balance Sheet Database (CBSD).

In order to allow for an efficient integration of the information stored in the different databases, the *Banco de Portugal* also maintains a business register of resident financial and non-financial corporations.

The three above-mentioned databases are briefly described next.

a. Securities Statistics Integrated System database

The Securities Statistics Integrated System (SSIS) database is a security-by-security and an investor-by-investor database, which was set up in early 1999 with a view to providing, in a single repository, data on the securities issues and holdings required by the different statistical domains (*e.g.*, monetary and financial statistics, external statistics, securities statistics and financial accounts), thus replacing the separate and distinctive data storing systems in place until then.

The concept of "securities" used in this database is fully in line with the definitions of the European System of National and Regional Accounts (ESA 95), covering both short- and long-term "Securities other than shares" (excluding financial derivatives) and "Shares and other equity".

Individual securities are identified by their respective International Securities Identification Number (ISIN) code. Whenever the ISIN code is not available, reporting institutions should identify the individual security, referring to its main characteristics relevant for statistical purposes: type of security, country and sector of the issuer, currency of issuance and original maturity. Resident investors are identified by means of a company registration number (*e.g.*, the fiscal number in the case of companies). For non-resident investors, the reporting institutions use their own codes but also provide information on the name, country of residence and institutional sector of the investor. In both cases, data on households are reported in aggregated terms, by investor country.

The main data sources as regards securities issues are:

▪ Euronext Lisbon

▪ The Securities Market Commission (acting as the national supervisory authority for securities markets)

▪ The general government

▪ *Interbolsa* (the ISIN national numbering agency in Portugal)

▪ Commercial data providers

▪ Resident financial institutions acting as intermediaries in issues of commercial paper by corporations

▪ The corporations themselves (when issuing abroad).

As for securities holdings, the reporting institutions are, primarily, resident monetary financial institutions (MFIs) and securities brokers and dealers – acting as custodians for the securities portfolios *(see Figure 2)*.

MFIs, investment funds and other residents with securities held in custody outside the resident financial sector report directly. The information reported, on a monthly basis, with a lag of 12 working days after the end of the reference month, refers both to flows (purchases and sales) and to end-of-period

positions. Flows are valued according to the respective transaction value and stocks may be valued according to market, acquisition or nominal value of the securities (by this order of preference).

Figure 2 – The SSIS
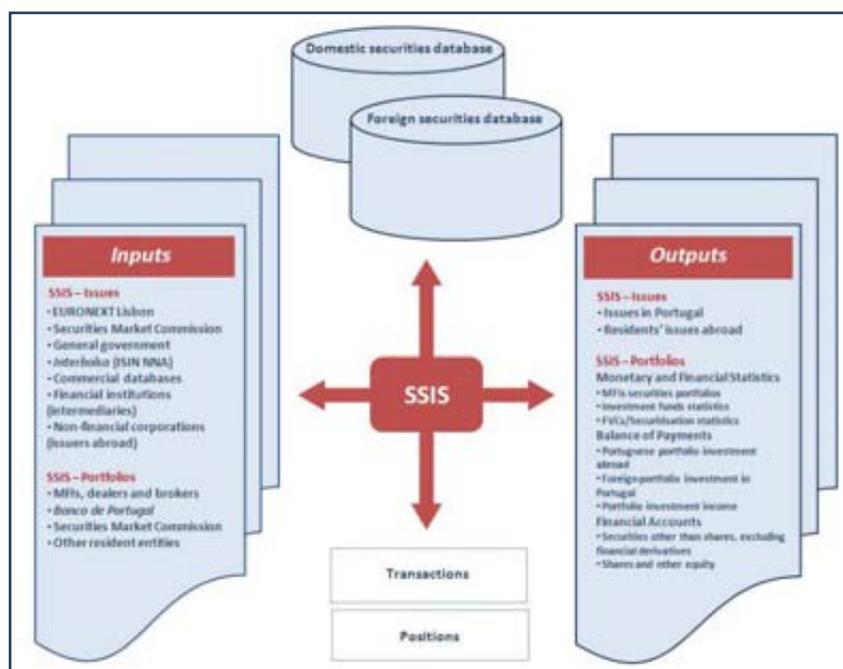
Apart from reducing the reporting institutions' response burden (as they do not have to aggregate individual basic data), the system enhances the data validation procedures, promotes consistency across the various statistical domains, and offers a timelier and more efficient response to *ad hoc* data requests from the users. In addition, the system allows for the compilation of more elaborated statistical outputs, such as the so-called "from-whom-to-whom" tables for securities. SSIS data are also used in the assessment of exposures on the balance sheets of resident financial institutions.

The volumes of data processed and stored in the domestic and in the foreign securities databases, covering both transactions and positions, give a hint on their current size:

▪ More than 90 thousand shares, 170 thousand debt securities and 10 thousand mutual funds shares/units stored.

▪ About 250 thousand entities (issuers and/or investors) registered.

▪ Over 300 thousand registers relating to portfolio data (flows and stocks) processed monthly.

The main statistical outputs extracted from the SSIS comprise:

▪ Securities issues in Portugal (either by residents or non-residents) and residents' issues abroad.

▪ Securities portfolios – to be used in the compilation of monetary and financial statistics (*e.g.,* investment funds statistics and securitisation statistics), balance of payments and international investment position statistics (*e.g.*, portfolio investment) and financial accounts (*e.g.*, securities other than shares excluding financial derivatives and shares and other equity).

The SSIS has also been used to liaise with the Centralised Securities Database (CSDB) developed within the European System of Central Banks (ESCB).

b. Central Credit Register database

The *Banco de Portugal* is responsible for the Central Credit Register (CCR), an administrative database that stores credit-related information supplied by the participants (basically all resident credit-granting financial institutions). The Portuguese CCR was established in late 1978 and has been managed

by the Statistics Department since 1999. In 2009 the system supporting the CCR went through a significant overhaul. Along with several technical improvements, additional details to the data collected and a more robust identification of private individuals were implemented, based on the personal tax identification number.

The primary objective of the CCR is to assist the participating institutions in their assessment of the risks attached to granting credit. However, according to the CCR legal framework, data from this repository can also be used for other purposes, *inter alia*: compilation of statistics, financial stability analysis, supervision and regulation of credit institutions and other financial corporations, economic research and the conduct of monetary policy. Confidentiality of individual information is guaranteed by law. In addition, the CCR is fully compliant with all the requirements for individual data protection as laid down by the Portuguese Data Protection Authority.

Information (on a borrower-by-borrower basis) about each of their clients' credit liabilities is submitted by the participants within a deadline of 6 working days following the end of the reference month, provided that its total value exceeds EUR 50. Approximately after two weeks, the *Banco de Portugal* aggregates the data for each borrower and returns to the participating institutions information on their own clients, with no identification of the individual institutions that granted the loans. Additionally, a participant may have access to information concerning individuals or entities other than its clients, whenever there is a credit request or an explicit authorisation to consult the database.

The information stored in the CCR database essentially refers to outstanding amounts of credit granted to individuals and entities (including non-performing loans and loans that were written-off but for which repayment is still seen as possible), as well as potential credit liabilities representing irrevocable commitments, broken down by:

▪ Purpose of the loan (*e.g.*, credit on current account, financial leasing, mortgages, consumer loans, credit cards' credit, unused lines of credit).

▪ Categories of credit (*i.e.*, individual loans, joint loans, personal guarantees).

▪ Loan status (*i.e.*, on-time, non-performing, written-off).

▪ Type and value of collateral.

▪ Original and residual maturity.

▪ The number of days a loan is past due (in case of default).

▪ Specific characteristics of the loan (*e.g.*, securitised loans, syndicated loans, loans used to back mortgage bonds, loans used as collateral in Eurosystem credit operations).

▪ Currency denomination of the loan.

▪ Country where the loan was granted (to cover loans granted to residents by foreign branches of Portuguese credit institutions).

The sheer size of this database provides a good indication of its informational potential as well as of its capability to meet the different foreseeable uses:

▪ 5.9 million private individuals and over 285 thousand corporations registered.

▪ 200 participants, covering all the credit-granting financial institutions.

▪ 15 types of financial products.

▪ 22.5 million records per month, on average.

The CCR database also takes in information on the credit liabilities of the Portuguese corporations *vis-à-vis* financial entities in other Euro area countries (currently, Austria, Belgium, France, Germany, Italy and Spain), which is available through the interchange of information among the European CCRs signatories of the 2003 "Memorandum of Understanding (MoU) on the exchange of information among national central credit registers for the purpose of passing it on to reporting institutions". The regular exchange of information among European CCRs is made on a monthly basis (with the exception of

Belgium and Germany, which participate on a quarterly basis) and covers borrowers with credit liabilities higher than EUR 25 thousand.

One of the most positive developments as regards the Portuguese CCR has been the steady improvement in its coverage, which has also been instrumental in making it possible the regular publication of statistical information based on this data repository. Currently, the CCR covers about 99 per cent of the overall credit balances reported within the scope of the monetary and financial statistics of the *Banco de Portugal*, with the possible methodological differences between the two systems appropriately factored in.

Moreover, the Portuguese CCR ranks first place in the World Bank's public credit registry coverage indicator *(see Figure 3)*, which reports the number of individuals and firms listed in a public credit registry[2] with information on repayment history, unpaid debts or credit outstanding from the past 5 years. The number is expressed as a percentage of the adult population (*i.e.*, the population aged 15 and above).

Figure 3 – Public credit registry coverage
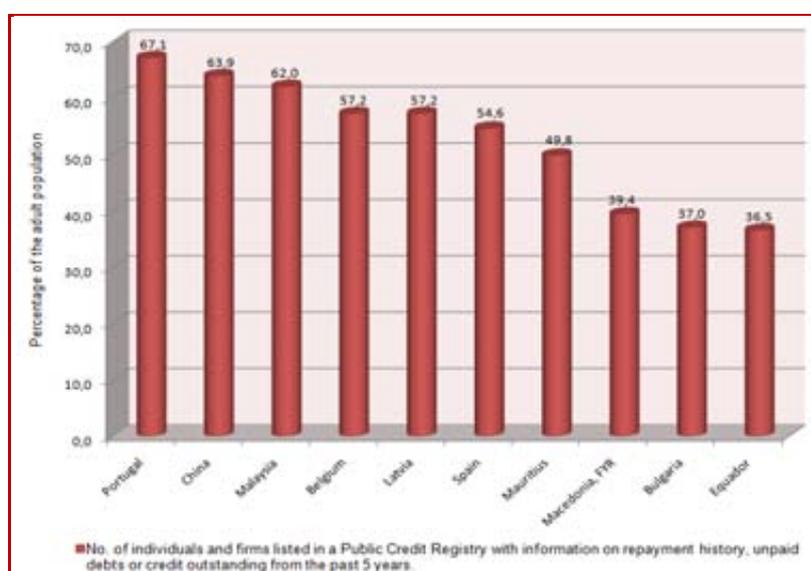
Source: World Bank, "World Development Indicators 2011"

The use of CCR data for statistical purposes has resulted in a significant improvement in the quality of *e.g.* monetary and financial statistics and national financial accounts, as it has enabled greater accuracy in the classification by institutional sector of the counterparties and additional breakdowns to the existing statistics (*e.g.*, by type, purpose, institutional sector, branch of economic activity, region and corporation size).

CCR data was also particularly useful in meeting the new European Central Bank (ECB) requirements on securitisation without having to increase the reporting burden on Financial Vehicle Corporations (FVCs). Furthermore, these data have been used in the assessment of exposures on the balance sheet of resident financial institutions, allowing for a timely and efficient response to *ad hoc* data requests from users.

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[2] In this context, *"a public credit registry is defined as a database managed by the public sector, usually by the central bank or the superintendent of banks that collects information on the creditworthiness of borrowers (persons or businesses) in the financial system and makes it available to financial institutions"* (The World Bank, 2011).

c. Central Balance Sheet Database

The Central Balance-Sheet Database (CBSD) of the *Banco de Portugal* was established in 1983, even though it only started operating effectively in 1987 (with data relating to 1986), when the coverage of its annual survey was enlarged to encompass the entire manufacturing sector. Over the ensuing years many improvements were made to the database. However, only in 2000 the CBSD started covering all sectors of economic activity. In the meantime, sampling methods were introduced aiming at getting the best possible coverage of the activities undertaken by the selected non-financial corporations, both in terms of activity and enterprise dimension – a move that was followed by more robust statistical results. Given its experience in the field of the CBSD, the *Banco de Portuga*l actively promoted the implementation of a reporting system for annual corporate accounts, which was completed in 2007, when the *IES* (a Portuguese acronym for *Informação Empresarial Simplificada*, meaning literally "simplified corporate information") was launched. The *IES* is the result of the joint efforts of four distinct public entities – the Ministry of Finance, the Ministry of Justice, Statistics Portugal (the Portuguese national statistical office) and the *Banco de Portugal* – and consists of a yearly submission of information by corporations, in a single, paper-free, electronic form, to fulfil reporting obligations of accounting, fiscal and statistical nature *(see Figure 4)*.

Figure 4 – The IES
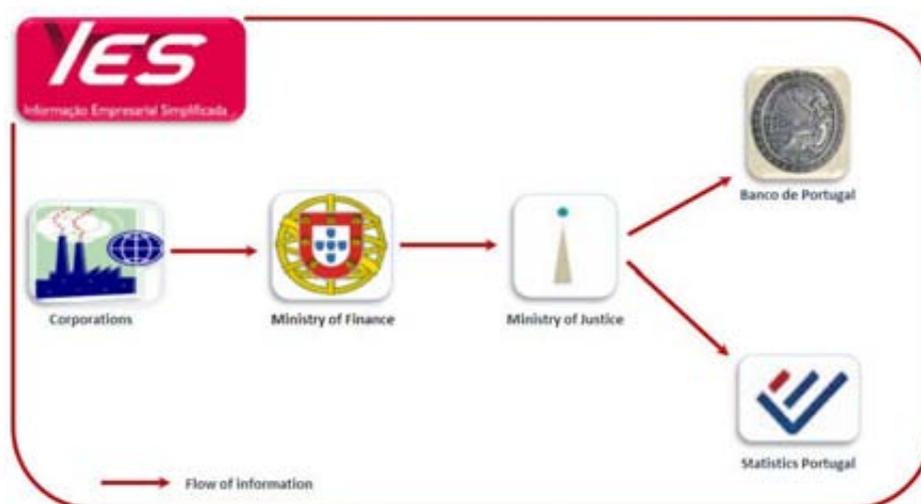
The *IES* arrangement allowed the *Banco de Portugal* to discontinue the former, non-mandatory, CBSD annual survey; moreover, given that some of the information needed for external statistics purposes became available within this framework, it made it possible for the *Banco de Portugal* to lighten its foreign direct investment surveys. As a result, the response burden for corporations was significantly reduced while, at the same time, the quality of statistics increased.

The coverage of the CBSD moved from 5 per cent of the total number of non-financial corporations up to 100 per cent (more than 350 thousand companies), whereas the number of variables collected rose from around 600 to more than 1,600. In general, corporations provide information with a 6 months' lag after the end of the reference year, which also represents an improvement from the previous situation (a time-lag of 10 to 12 months).

Data, submitted on a mandatory basis, refer to: (i) basic identification information; and (ii) comprehensive accounting data (balance sheets and income statements) on an unconsolidated basis.

Currently, the CBSD information is widely used for a variety of purposes, *inter alia*:

▪ Compilation of aggregate statistics on non-financial corporations.

▪ Submission of internationally comparable statistical aggregates to the BACH (Bank for the Accounts of Companies Harmonised) and the ESD (European Sectoral References Database) databases.

▪ Dissemination of the so-called enterprise and sector tables, which comprise a number of annual indicators for sector of economic activity / size classes of non-financial corporations. Among other uses, these data allow every company participating in the aggregates of sector tables to gauge its relative position within each aggregate.

Several other statistical domains use CBSD information as an input. For instance: data on trade credits, own funds for non-listed companies, inter-company loans, non-financial corporation's contributions to pension funds and loans granted by private shareholders are used in the compilation of the national financial accounts; external trade (services), trade credits, foreign direct investment and loans granted by foreign credit institutions supplement the production of external statistics. Also, the CBSD contributes to the regular updating of the earlier-mentioned business register.

3. Going one step farther by using the available data more efficiently

In an ongoing effort to reduce respondent burden and to improve the overall quality of its statistics, the *Banco de Portugal* has been working to increase the use of micro-databases and item-by-item reporting. Notably, this approach has permitted, *inter alia*:

▪ To improve the responsiveness to users' requirements, particularly those arising from *ad hoc* information requests, with proven results in reducing or eliminating data gaps and in monitoring and assessing developments in the Portuguese financial system, *e.g.* in connection with the recent global financial crisis.

▪ To curtail the (very demanding, in terms of use of resources and time) follow-up procedures as regards data collecting schemes, whereby respondents are re-contacted after the initial submission of data, to obtain missing information and/or to verify and, if necessary, to correct questionable data.

▪ To enhance the quality control procedures (*e.g.* by cross-checking elementary/raw data from different statistical domains), thus increasing the efficiency of the production process and improving the quality of end products.

▪ To avoid data redundancy, while at the same time expanding significantly on the range of statistics available.

Furthermore, the use of the available micro-databases for the compilation of the Portuguese flow-of-funds within the national financial accounts has proved to be extremely helpful, as it allows for a much better understanding of the interlinks within the economy and *vis-à-vis* the rest-of-the-world. Actually, if need be, micro-data have the potential to support the drilling down of the most summarized levels of data to the most detailed ones, which, in turn, may help to confirm (or to disprove) the trends and developments conveyed by macroeconomic statistics and, concomitantly, to explore and/or to elucidate their possible implications for *e.g.* financial stability analysis and systemic risk assessment.

Developing a business intelligence[3] architecture *(see Figure 5)* capable of enabling efficient data analysis could significantly contribute to meeting this objective.

With this in mind, the *Banco de Portugal* set off a study in 2008 aiming at defining a business intelligence framework to be used as a reference in all future information technology developments in the statistical domain.

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[3] Nelson (2007) describes "business intelligence" (BI) as *"a broad category of applications and technologies for gathering, storing, analysing, and providing access to data to help enterprise users make better business decisions. BI applications include the activities of decision support systems, query and reporting, online analytical processing (OLAP), statistical analysis, forecasting, and data mining."*

This framework will be built upon three pillars:

▪ A data warehouse, to guarantee a central access point to all statistical data, independently of the input source or the production process.

▪ A centralised reference database, to provide common reference data and to enable the linkage of information across different sources and systems.

▪ A common technological infrastructure, across the various information systems, to facilitate the integration and re-usage of components and to promote data access efficiency and transparency to final users.

Figure 5 – Business intelligence architecture for statistics
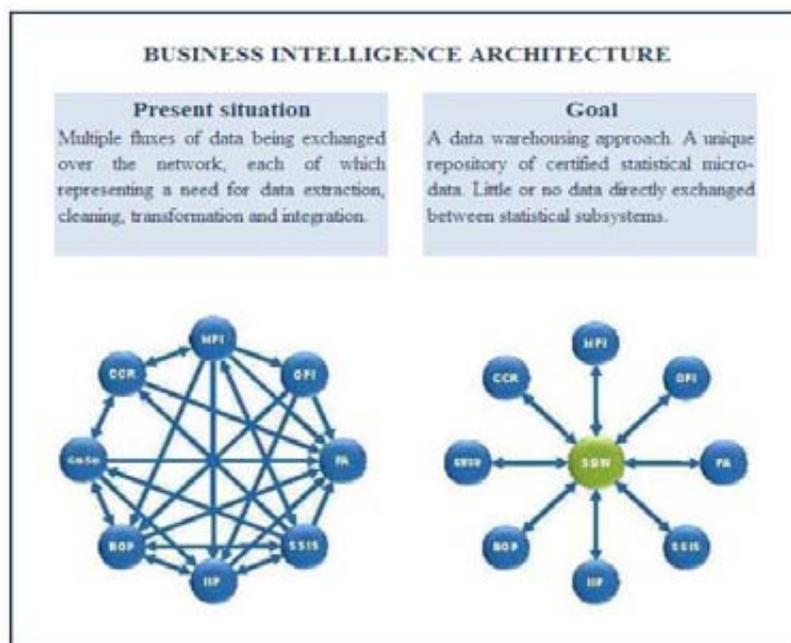
Such possibility paves the way to a workable strategy to deal more effectively with the data issues arising from financial crises, such as the ones we are facing now. Indeed, rather than relying only on gathering new information on financial innovation-related activities and/or restraining these activities through heavier regulation, it seems more promising to improve the overall efficiency of the statistical framework by further exploring the largely unused statistical potential of already existing data sources, in particular linking micro-data to macro-risks.

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