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Towards a Eurostat framework for disseminating innovative/experimental statistics

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Abstract

European statistics is recognised as a brand for high quality statistical information. However, in reality, individual quality dimensions, such as timeliness, reliability, accuracy etc. may well vary between statistical products, given that they have been defined in relation to their use. Likewise, for a given statistical product, they may change over time reflecting its importance and changes in data sources.

Where European statistics directly feed high level policy making or regulatory purposes, they are bound to comply with highest quality standards and reinforced monitoring thereof in line with the recent Commission Communication "Towards robust quality management for European Statistics".

This paper looks at the opposite end of the scale, where European statistics are produced and disseminated in an 'experimental' manner to serve a different set of user needs, and where relevance is crucial compared to other quality dimensions. Based on a review of selected existing approaches, the paper sets out a possible framework for Eurostat, defining criteria for the dissemination of innovative/experimental statistics and providing a range of possible products, including e.g. to supplement Principal European Economic Indicators.

Keywords: European statistics, Code of Practice, quality labelling, experimental statistics, modeling.

AMS Classification: 62A04, 62D06

Hacia un marco de Eurostat para difundir estadísticas innovadoras/experimentales

Resumen

Las estadísticas europeas son reconocidas como un distintivo de información estadística de alta calidad. Sin embargo, en realidad, las dimensiones individuales de calidad, tales como oportunidad, fiabilidad, acuracidad, etc. pueden variar notablemente entre los distintos productos estadísticos, teniendo en cuenta que se definen en relación a su uso. Asimismo, para un determinado producto estadístico, pueden cambiar a lo largo del tiempo reflejando su importancia y cambios en las fuentes de datos.

Cuando las estadísticas europeas son utilizadas para alimentar directamente la toma de decisiones políticas a alto nivel o con fines legislativos, están obligadas a cumplir con los más altos estándares de calidad y el reforzado control de los mismos en línea con la reciente Comunicación de la Comisión "Hacia una gestión sólida de la calidad las estadísticas europeas".

Este artículo considera el lado opuesto de la escala, cuando las estadísticas europeas son producidas y difundidas de manera 'experimental' para satisfacer un conjunto diferente de necesidades de los usuarios, y donde la relevancia es crucial comparada con otras dimensiones de calidad. Tomando como base la revisión de una selección de los actuales enfoques, este artículo expone un posible marco para Eurostat, definiendo criterios para la difusión de estadísticas innovadoras/experimentales y ofreciendo un abanico de posibles productos, incluyendo p. ej., complementar los Principales Indicadores Económicos Europeos.

Palabras clave: Estadísticas europeas, Código de Buenas Prácticas, Etiqueta de calidad, estadísticas experimentales, modelización.

Clasificación AMS: 62A04, 62D06

1. Introduction

European official statistics has become a brand for high quality statistics. The European Statistical System (ESS) approach to quality management so far has worked towards serving this image. More specifically, ESS-wide quality management and the implementation of the European Statistics Code of Practice [1] have followed an encompassing approach, covering all statistical domains, thus to some extent implicitly suggesting equally high levels of quality for all its products. Eurostat user satisfaction surveys generally confirm users' trust in the European statistics brand: the overall quality of European statistics is assessed more positive than those quality dimensions that can be directly observed by the users themselves (like e.g. timeliness or accessibility) [2].

In practice, the quality of European statistics is not an absolute feature to be dealt with as a 'stand-alone' issue. Nor are quality levels equally high for all products or all dimensions. Instead, the quality of European statistics has to be understood as a relative

concept, the products' characteristics being defined in relation to users' needs. In so far the European statistics approach to quality has to be dealt with in a particular context and in an integrated manner. The 'fit for purpose' concept of statistics was developed in order to communicate the relative and differentiated character of statistical quality. However, as to date, ESS reporting on quality to users conveys a rather homogeneous picture, especially at the European level [3].

To some extent this reflects certain difficulties with regard to measuring quality at the European level: To the extent that European statistics are legislated and to the extent that accuracy and comparability requirements are laid down in legislation, the situation is rather transparent. This holds at least for national data and respective information can be found in the corresponding quality metadata sets. Looking at the European level, the situation becomes much more complex as quality information has to be aggregated across numerous countries. This complexity is reinforced by the fact that European statistics increasingly stem from a mix of data sources. Accordingly, accuracy estimates can at best be approximated, so that a quantitative assessment of accuracy, and to some extent comparability, becomes almost impossible. Thus, European level quality metadata usually refers to accuracy being 'high' or 'as high as it can be'. This assessment is made on the basis of national level producer-oriented quality reports which provide information on both process and output quality. It also assumes that data from the ESS members undergo sufficient quality assurance procedures, largely in line with the Code of Practice and the ESS Quality Assurance Framework [4].

The rather homogeneous picture of data quality conveyed to users also reflects the fact that 'fitness for purpose' in practice means that once statisticians have understood the users' needs and intended purpose of the data, it should be left to the statistician to decide on how these needs can be met. In doing so statisticians are subject to a number of constraints, most importantly data collection costs and burden so that data quality is being optimized for a given sample size, level of production costs and reporting burden. In so far, it seems legitimate to assume and to claim to users that for the principle mass-use of European statistics, the quality levels provided by the ESS can indeed be considered 'high', or more specifically, 'the highest possible under given constraints'. Thus, the predominant existing label of European statistics, its brand, which is associated with 'high quality levels', is appropriate to the extent that the underlying statistics serve the intended use and that they form part of the *standard* product assortment. This holds even though this label summarizes a wide range of de facto quality characteristics, which may well vary from one product to another but which are still being considered *relatively* high.

In the special situation where statisticians realize that with a given mix of input, they are not able to adequately address the standard quality requirements and thus the product provided does not really fit the mainstream purposes, there is a need to clearly and openly communicate this fact and be explicit about the limitations compared to *standard* uses. Likewise, statisticians will need to communicate to users where quality assurance procedures exceed standard practices, thus enabling the use of data for specific political purposes which require such guarantees. Recent developments in

European statistics lead to the introduction of certification procedures with the aim to provide highest levels of quality assurance for a subset of statistics. European statistics may thus need further labels than just its existing "brand", opening the door for a more differentiated approach to quality. Such an approach would allow communicating about the extreme ends of quality. It would facilitate understanding and accessibility by users of *non-standard* products, subject to non-standard levels of quality assurance. Below this approach of labeling of statistics 'fit for non-standard purposes' is developed further.

2. Differentiated approach to quality

An important reason to deviate from a one-fits-all approach to quality in European statistics arose from the need for higher quality assurance for a subset of statistics. In its Communication 211(2011) [5], the Commission has set out a strategy towards reinforced quality management for Government Finance Statistics which could be extended to other areas of high political importance, including monitoring of policy implementation subject to targets or corridors based on European statistics. The strategy comprises data quality assurance moving from a mainly corrective to a preventive approach and addresses the quality of national data given its interdependence with the quality of European statistics.

At the same time another rather opposite segment of non-standard uses exists, for which a different quality mix is appropriate. For users of these statistics, relevance is crucial next to high timeliness. This may in some cases even mean that the mere availability of some proxy statistical information will be considered sufficient. In so far deviations from standard (quality) approaches can be well justified in order to provide complementary information, capture emerging phenomena, innovate or where standard sources are simply not available, e.g. due to high costs or burden for respondents.

3. Lessons from existing frameworks for the dissemination of non-standard statistics

Within the segment of non-standard statistics generally referred to as 'experimental statistics', not many examples can be found. While some data has been disseminated as 'experimental statistics' on an ad hoc basis, including by Eurostat, a systematic approach has been adopted by the UK Office for National Statistics (ONS) [6] and the European Central Bank (ECB) [7]. Both institutions have defined the concept as part of their quality framework. This chapter briefly reviews these approaches in terms of differences and similarities as well as their lessons for defining the Eurostat path.

The ONS' 'experimental' label is designed to provide clear signposting for novel statistics, the analysis and interpretation of which need special caution. The label's purpose is to stimulate user feedback on the usefulness of the data. This feedback helps the ONS to make an informed decision on whether to adopt them as 'National Statistics' –subject to further developments and improvements– or to withdraw them. The ECB's approach is based on ECB's internal users' demand for experimental statistics, which are disseminated also to the broad public in line with the principles of transparency and impartiality. A

small set of quantitative (e.g. less than 80% coverage of the total euro area) and qualitative (e.g. insufficient degree of harmonization of concepts across countries) criteria is used to distinguish experimental statistics from the standard products.

While each approach relies on a rather different set of criteria, they underline the importance of such explicit guidance for both users and producers about which statistics are disseminated under which label. This holds even though it can be assumed that the application of the criteria is subject to discussion and will evolve over time.

ONS and ECB approaches also differ in terms of the statistics' development perspective and thus its in-and-out-mobility of the label. Are experimental statistics meant to remain in this category or should it be understood as a transitory attribute? And –related– how stable or dynamic is the list of experimental statistics? These characteristic are important for users' orientation and should be made an explicit part of the experimental statistics label.

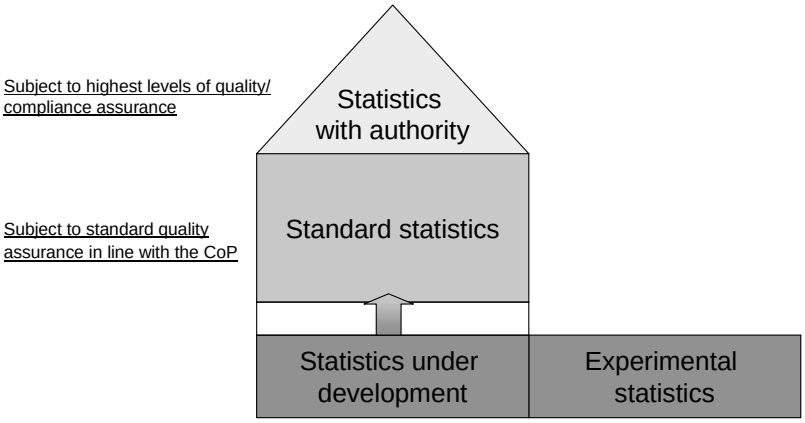
Finally, from the existing approaches one fundamental lesson emerges: the intended user guidance can only materialize when supported by adequate dissemination channels. Dissemination of experimental statistics should not only follow uniform practices, accompanied by clear metadata, but also be clearly separated from the typical channels as otherwise users may easily fail to recognize their different nature.

4. Towards an extended Eurostat quality framework

In line with the Communication on robust quality management, work is underway in Eurostat to supplement its quality framework to serve special needs requiring highest levels of quality and compliance assurance. This paper outlines steps towards extending it further, moving also into the opposite direction. In order to systematically address deviations from standard practices to achieve optimal levels of relevance, paying less attention to other quality dimensions and to make the results available to users in a transparent manner, Eurostat plans to expand its statistics assortment through the explicit integration of two further categories: (1) *statistics under development* and (2) *experimental statistics*. By differentiating between statistics under development and experimental statistics, Eurostat is positioning itself in between the quality frameworks of the ONS and the ECB. Both institutions refer to 'experimental statistics' only, covering however rather different concepts. Moving from the current situation of a scattered landscape based on ad hoc choices, towards a systematic approach based on a set of pre-defined criteria, Eurostat strives to promote and improve its use of such concepts and at the same time facilitate users' overview. The picture below provides an illustration.

Picture 1

Overview of an extended quality framework for European statistics



The 'standard' products aim to serve the vast majority of users. They are subject to standard quality assurance in line with Code of Practice. This segment comprises what is usually referred to when talking about European statistics: statistics compiled in line with what can be considered as state-of-the-art or standard practice, following well-defined and agreed (traditional) methods, standard classifications, usually –but not necessarily– underpinned by European legislation. However, it should be noted, that also within the category *standard* product, different levels of quality may prevail. This category thus basically signals to users that these statistics are ready to use. Their most important common feature is the fact that they are disseminated in the Eurostat standard dissemination database (Eurobase).

To the extent that these statistics are used as a basis for regulatory purposes or the compilation of indicators to measure progress towards politically defined targets, they would be subject to a reinforced quality regime, thus moving upwards to the upper segment of the quality framework.

4.1 Statistics under development

Statistics under development are not yet fully mature to fit mainstream purposes and are thus disseminated separately clearly indicating their status and main characteristics. The following criteria apply:

(a) statistics are subject to serious shortcomings with regard to selected quality dimensions (mainly accuracy and/or comparability and/or coverage having an impact on the accuracy of the European aggregate). Reasons can be manifold and may comprise e.g. that statistics have been collected as a pilot covering a small subset of countries only, or the use of inadequate or not fully adequate concepts, sources and/or methods

and/or

(b) statistics have explorative character, involving testing of feasibility of data collection, methods, classifications and on which user feedback is being sought.

and

(c) it is expected that the quality shortcomings can/will be addressed in the future with a view to make these statistics available within the standard dissemination channels.

The decision about the maturity of statistics under development and thus their change in status to "standard" statistics or –alternatively discontinuation– will take into account users' views following their explicit consultation.

4.2 Experimental statistics

Experimental statistics deviate from current standard practices, methods or sources. Like for statistics under development, the following criterion applies:

(a) experimental statistics are subject to serious shortcomings with regard to selected quality dimensions (mainly accuracy and/or comparability and/or coverage). Reasons can be manifold and may comprise e.g. that statistics have been compiled with estimation/(probabilistic) modeling techniques, involving *substantial* assumptions, or the use of inadequate or not fully adequate concepts, sources and/or methods (e.g. where data sources only approximate the statistical definitions). Finally, experimental statistics could cover cases in which the derivation of sub-aggregates may require a level of detail not foreseen in the data collection and thus subject to (severe) accuracy constraints.

In addition, experimental statistics

(b) can be expected to remain permanently in this category, a continued user-interest being assumed.

5. Practical application of the enlarged quality framework

With regard to European statistics, manifold applications of these concepts will be possible. So far, most experience relates to the dissemination of what would fall in the category of 'statistics under development' comprising e.g. dissemination of pilot data collections carried out to test new concepts prior to their formalization in ESS agreements or legislation. Typically they would involve only a subset of countries, like e.g. in R&D budget statistics - transnationally coordinated research released in August 2011. Further examples are available on the Eurostat website under "Statistics explained".

In the following three sections this new approach of an extended quality framework is applied to developments around the Principal European Economic Indicators (PEEIs), demonstrating its feasibility, the criteria's discriminatory power and areas for further discussion [8]. To illustrate the borderlines between statistics under development and experimental statistics, three main examples are briefly explained below, followed by a short section positioning them within the revised framework.

5.1 Tools for the development and validation of new indicators

A vintage database for real time analysis

Eurostat has developed a real-time database containing all data vintages for PEEIs since 2001. A daily storing of the back-ups of the Eurostat Euroind database has been subject to a long and complex process of automatic cleaning up to extract vintages, followed by a validation process which is still on-going. At present the database covers all PEEIs, together with some breakdowns, as well as some additional indicators for the Euro area, the European Union aggregates as well as Member States. Despite the fact that the validation process is still on-going, the database is already in use internally in Eurostat providing a robust and effective simulation and validation framework.

Back-calculations for long time series analysis

Concerning the unavailability of long time-series, which is mainly due to some changes related to the classification used or methodological and definitional improvements, the Eurostat approach for the reconstruction of long time-series has been based on a system of static regressions estimated on the first differences of the new and the old series, over their overlapping period, with a moving average correction term [9]. This system of static regressions allows to back-cast the values of the new series based on the pattern of the old one. It is complemented by a set of univariate and multivariate benchmarking procedures to ensure the consistency between high and low frequency data, whenever required, and between aggregates and components. The reconstruction of long seasonally adjusted time-series is carried out by following the same seasonal adjustment strategy adopted by the Eurostat production units. At the moment long time-series are available for National Accounts, unemployment, employment and some short-term business indicators such as industrial production, retail trade etc. for the Euro area and also for the European Union since beginning of the 70s' according to the available information. The objective is to reconstruct homogeneous long time-series based on the so called movement preservation principle, so that past dynamic of the indicators is preserved.

Positioning of the tools for the development and validation of new indicators in the Eurostat extended quality framework

Applying the above mentioned criteria, the fact that both tools are based on existing 'standard' statistics with the real time database being an extension of their use by presenting historic data and the long-time series being subject to rather standard statistical integration techniques, the tool's proximity to Eurostat standard products seems clear. For the time being both tools are considered in need of further development. At some stage they may thus be either published as *statistics under development* –subject to further improvements– or directly as standard European statistics. However, given their status of an analytical tool for highly specialised users and the fact that they may be easily confused with existing European statistics, they will need to make use of dissemination channels which provide for them being separated from parallel official time series and for sufficient explanatory information.

5.2 Improving timeliness and frequency

Improving timeliness in data release

Even though flash estimates have been produced for the GDP and the HICP as well as for retail trade turnover, the timeliness gap with the US still persists for almost all PEEIs. In order to allow for a real-time monitoring of the Euro area economic situation and to permit an effective comparison of the Euro area with the US economic situation, Eurostat has launched a series of experiments to obtain earlier estimates by means of several model-based techniques targeting GDP, industrial production index, employment and producer price index [10]. Two well distinct strategies have been followed: one based on so called nowcasting techniques (i.e. forecasting techniques applied to the estimation of the recent past or the present) [11]; the other based on the construction of growth composite coincident indicators (i.e. a proxy time-series replicating the movements of the target variable earlier available). The two approaches differ both in terms of the information set used and the statistical and econometric tools considered. The results obtained have been compared with the Eurostat first and last estimates and accuracy has been analysed with broadly satisfactory results, mainly for GDP, employment and production price index.

Improving the frequency of the data releases

With a view to overcome obstacles to high frequency effective monitoring of the economy, Eurostat has invested in an econometric framework for the construction of monthly indicators starting from quarterly ones by using all available monthly and quarterly information. This framework consists of an unobserved component model written in a state space form, in which a monthly set of common factors models (composed of one or two factors), according to the Stock and Watson methodology, is used to interpolate quarterly variables subject to temporal constraints. Current in-quarter estimates are obtained by extrapolations until the new quarterly data become available. This framework has been applied to the construction of a monthly indicator of economic activity for the Euro area (EuroMind) which can be considered as a real proxy of GDP at monthly frequency [12]. Two versions of this indicator have been regularly compiled and tested in real-time: the first one based on one single factor which at the month t provides estimates for the month t-2, and the second one based on two factors (where the second factor synthesises information from qualitative survey) which, at time t, can also provide estimates for the month t-1 and even t itself. It is worth to notice that these models produce also, as by-products, indicators at disaggregated level and that the approach, in principle, can be extended to other domains to produce further new high frequency indicators. By and large, the approach is not very different from those actually used in several countries to compile quarterly national accounts. The main distinguishing characteristic is the ability to deal in an optimal way with noised information such as monthly one.

Positioning of the statistics improving timeliness and frequency in the Eurostat extended quality framework

In applying the above mentioned criteria, the statistics' unconventional character combined with the fact that they strongly rely on modelling techniques and assumptions, seem to position them outside standard European statistics and in line with the criteria for *experimental statistics*. However, with European statistics standards currently moving towards an increased use of modelling (e.g. according to the recommendations of the forthcoming handbook on rapid estimates or on cyclical composite indicators) [13] [14], it is becoming clear that the definition of the borderline between what is considered 'standard' and what is considered 'experimental' will need to be discussed and depends on the prevailing paradigm at a given time. In so far, the criterion for experimental statistics to 'remain in the category' as well as the intention to integrate statistics under development into the ESS standard assortment have to be understood within a given context and time.

5.3 Extracting relevant signals from PEEIs' time series

To extract relevant cyclical signals from existing PEEIs time-series, Eurostat has developed two projects: the first one aims to produce reliable estimates of the cyclical component expressed as a deviation from the trend by using univariate and multivariate methods [15]; the second aims to proper identify turning points of various cyclical movements [16], [17]. Since some of the cyclical estimates, based mainly on univariate methods, are already disseminated in the Eurostat Eurostatistics monthly publication, for the purpose of this paper the focus lies on the second kind of activities. Usually when defining turning points indicators, the first step is to identify the reference cycle on which we want to work: the classical business cycle, the growth cycle or even the acceleration cycle. In the approach chose here, Eurostat has decided to work jointly on business and growth cycle following the so called ABCD approach where A and D represent respectively peaks and troughs of the growth cycle and B and C those of the classical business cycle. The methodology adopted has been based on composite turning points indicators including a very limited number of series. Individual series components are modelled by using Markov Switching autoregressive models. Based on such class of models the economy is assumed to be in an expansionary phase if the recession probability returned by the model is lower than 0.5, and in a recessionary phase when the recession probability if higher than 0.5. The final result is obtained by averaging the probabilities of recession for each component series by using weights reflecting the relative reliability of the component signals. Weights are calculated in a real-time simulation exercise where the benchmark is represented by a past turning points dating obtained by a simple non-parametric dating rule on the industrial production. In this way Eurostat has developed two composite turning points indicators: one for the growth cycle (GCCI, Growth Cycle Composite Indicator) and the other for the classical business cycle (BCCI, Business Cycle Composite Indicator). Due to the different lags characterising GCCI and BCCI, the sequence ABCD is not always respected. To overcome this inconvenience a multivariate modelling strategy is being pursued using Markov Switching VARs.

Positioning of statistics on business cycle dating in the Eurostat extended quality framework

Given the indicators probabilistic nature and the substantial assumptions involved, these statistics qualify for the label *experimental*, providing an innovative supplement to the more traditional products. Despite the high relevance this kind of information can have for policy makers and analysts, they can be considered to permanently remain in this category as this kind of activity can be located rather outside the usual business of statistical agencies.

6. The way forward

Positioning of the examples related to PEEIs has demonstrated that in principle the criteria for a differentiated approach to quality labeling can be applied in a straightforward manner. However, they should not be considered as being written in stone. In practice, some flexible and pragmatic solutions may be needed bearing in mind the ultimate purpose of this labeling strategy, to serve users and offer a transparent access to our statistical products. The examples have also shown that the criteria will need to be understood within a given context and time and in relation to society's perception of official statistics' role. As discussed under 5.2, the increasing use of modeling techniques may lead to shifts of the borderline between experimental and standard practices. Similarly, not so long ago, applying seasonal adjustment to official statistics time series would have been considered experimental, while as of today it is widely recognized standard practice. In so far official statisticians also have the role in leading the best perception of official statistics by promoting a more and more elaborated set of products which better serve the policy makers and users' analysis. With European statistics coming from a paradigm of 'providing information to the state administration' and having moved to 'providing for free information to the whole society', European statistics is now moving further towards 'providing infrastructure for statistics and a data warehouse'. These developments go hand in hand with different levels of acceptance by users and producers of what is considered *standard* and *non-standard* quality and practices.

Next to these conceptual issues, the extended approach will need to be accompanied by some practical considerations. In order to provide the intended user guidance, the new product categories *statistics under development* and *experimental statistics* will need to be disseminated in a way that they are clearly separated from the standard products.

The existing web-platform "Statistics Explained", accessible from the Eurostat homepage (http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Main_Page), may provide an adequate channel. It easily allows placing relevant metadata next to the data, e.g. information pertaining to the more general quality framework as well as the specific nature of the data.

In addition, room will need to be provided for an explicit consultation of users. This may well take place within existing fora and established practices (e.g. hearings with Directorates General of the Commission, ESAC, FEBI and other groups). At the same time, an entry for user comments next to the data series will need to be made available

so that all users are given the opportunity to comments on these non-standard products. These various forms of consultation should be taken into account when deciding about the future of a product (to be retained or not, to be developed further or not to become a standard product, etc.).

Finally, the Eurostat quality assurance framework will need to be modified in line with the enlarged product assortment. An open question remains to what extend this enlarged approach can or should be limited to the European level only. Some questions are put forward for further discussion: Should the approach be restricted to Eurostat level? What should be done (if anything) at the level of the NSIs? How should national practices be taken into account? What are the implications if they do not (fully) coincide? Are there any implications with respect to credibility of European statistics?

References

[1] EUROSTAT (2011) European Statistics Code of Practice, revised edition. *http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-32-11-955*.

[2] EUROSTAT (2011) Report on the Eurostat 2011 User Satisfaction Survey. *http://epp.eurostat.ec.europa.eu/portal/page/portal/quality/documents/USS2011_Report.pdf*.

[3] BOHATÁ, M. (2011), «Fit-for-Purpose Statistics for Evidence Based Policy Making», Conference on Communication: A tool to enhance statistical culture, Visegrád, Hungary, 9-10 June.

[4] EUROSTAT (2011) European Statistical System Quality Assurance Framework, Version 1.0 *http://epp.eurostat.ec.europa.eu/portal/page/portal/quality/documents/QAF_version_1.0_EN.pdf*.

[5] EUROPEAN COMMISSION (2011), Communication from the Commission to the European Parliament and the Council «Towards robust quality management for European Statistics», COM (2011) 211.

[6] OFFICE FOR NATIONAL STATISTICS WEBSITE, Guide to Experimental Statistics frequently asked questions: *http://www.ons.gov.uk/ons/guide-method/method-quality/general-methodology/guide-to-experimental-statistics/index.html.*

[7] EUROPEAN CENTRAL BANK WEBSITE, Experimental data: *http://www.ecb.int/stats/intro/html/experiment.en.html*.

[8] MAZZI G.L., MONTANA G. (2009) «A system of Rapid Estimates to Improve Real-Time Monitoring of the Economic Situation: the Case of the Euro Area», *National Institute Economic Review*, No.210 October 2009.

[9] CAPORIN M., SARTORE D. (2004) «Methodological aspects of time series back-calculation», *European Commission Working Papers and Studies, http://epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/KS-DT-05-029/EN/KS-DT-05-029-EN.PDF*.

[10] MAZZI G.L., MOAURO F. AND CANNATA R.R. «A statistical overview of the economic situation in the euro area», forthcoming 2012.

[11] MAZZI G.L., MITCHELL J. AND MONTANA G. «Density nowcasts and model combination: nowcasting Euro-area GDP growth over the 2008-9 recession», forthcoming 2012.

[12] FRALE, C., MARCELLINO, M., MAZZI, G. AND PROIETTI, T. (2011). EUROMIND: A «Monthly Indicator of the Euro Area Economic Conditions», *Journal of the Royal Statistical Society - Series* A, 174, pp.439-470.

[13] EUROSTAT AND THE CONFERENCE BOARD, «Handbook on Cyclical Composite Indicators» ed. by Mazzi G.L. and Ozildrim A., forthcoming 2013

[14] EUROSTAT, «Handbook on Rapid Estimates», ed. by Barcellan R. Ladiray D. Mazzi G.L., forthcoming 2013.

[15] LADIRAY D., MAZZI G.L., SARTORI F. (2003) «Statistical Methods for Potential Output Estimation and Cycle Extraction», *European Commission Working Papers and Studies, http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-AN-03-015/EN/KS-AN-03-015-EN.PDF*.

[16] ANAS J., M. BILLIO, L. FERRARA, G.L. MAZZI (2008) «A System for Dating and Detecting Turning Points», *Manchester Bulletin*, vol. 76, n°5, 549-577.

[17] BILLIO M., FERRARA L. MAZZI G.L., MOAURO F. (2011) «A multivariate system for turning point detection in the Euro Area», *www.oecd.org/dataoecd/47/58/49067716.pdf*.