How to Turn Quality into a Habit in the Statistical Production?

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Abstract

One of the main purposes of the Statistics Department of Banco de Portugal is to ensure a statistical production with high quality standards aiming at fully meeting users' needs, aligned with the best practices and procedures recommended by the international organizations. Following its commitment to quality, one of the Bank's priorities is to develop a wide set of quality control procedures that ensure high levels of regular and thorough review of the key statistical outputs.

Statistical quality control is based on different procedures and working arrangements that make sure that processes are effective and efficient and the risks are mitigated. In order to achieve higher quality statistics, there are several quality indicators performed by the primary statistics' compilers.

This paper will present the main quality indicators used and the ongoing process to improve the model of regular and systematic quality controls.[4]

Keywords

Statistical quality control, quality assessment, quality indicators

JEL code

G20, L15, M42

INTRODUCTION

The statistical data published by Banco de Portugal complies with the quality management guidelines and best practices laid down in national and international documents like ESCB Public Commitment, European Statistics Code of Practice, ECB Statistics Quality Framework, and IMF Data Quality Assessment

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Framework (DQAF). DQAF includes a set of prerequisites, and five dimensions of data quality: (i) assurances of integrity, (ii) methodological soundness, (iii) accuracy and reliability, (iv) serviceability and (v) accessibility.

With these dimensions in mind, Banco de Portugal statisticians have implemented effective and efficient statistical procedures throughout the statistical production chain, in line with principle 8 of ESCB Public Commitment – "Appropriate statistical procedures". Moreover, their routines are driven by "High output quality" principles (towards relevant, accurate, reliable, timeliness, consistent and accessible statistics).

Nevertheless, it is difficult to assess to what extent they are daily engaged to principle 4 of the same document – "Commitment to quality" (it systematically and regularly identifies strengths and weaknesses to continuously improve process and product quality). For that purpose, Banco de Portugal is currently defining a model of quality indicators to systematically measure the quality of its statistical systems and outputs.

Turning the performance of quality indicators into a habit will allow to: (i) document quality control procedures, (ii) make comparisons amongst different statistical domains and along time series, (iii) reveal the weaknesses of the systems, and (iv) set priorities when planning the statistical activities for the coming years.

In "The Power of Habit" by Charles Duhigg, the award-winning business reporter for The New York Times explains why habits exist and how they can be changed. "The process within our brains is a three-step loop. First, there is a *cue*, a trigger that tells your brain to go into automatic mode and which habit to use. Then there is the *routine* (…). Finally, there is a *reward* (…)." When figuring out how to spark a craving, the author argues that it is easier to convince someone to adopt a new behaviour, if the same cue and reward is kept.

To foster new habits, the new routine that comes with the proposed model of quality indicators must be easy to implement, and it must be accepted by all stakeholders as an added value process.

1 CUE

Whenever a new production cycle begins, the cue for statisticians in the Statistics Department of Banco de Portugal is to produce high quality statistics, following the motto of Banco de Portugal's Strategic Plan for 2017–2020: "Always do better".

2 ROUTINE

To pursue this objective (high quality statistics), the Statistics Department of Banco de Portugal created the Statistics Audit Unit (SA Unit) in 2004, with a specialized team responsible for regularly assessing data quality and legal provisions' full compliance. One of the ways to address statistical quality control is carrying out statistics audit operations, with the purpose of evaluating the efficiency of procedures in place, and promoting the sharing of good practices.

Once a year this Unit also produces statistics quality reports (compiler oriented) for the main statistics to assess the quality of the current statistical compilation and, ultimately, to identify opportunities for improvement and future developments towards statistical efficiency.

After all that is being done, what is missing? Quality reports shed light on systems' constraints and include suggestions/recommendations to change and improve current practices. But since they are annually produced, during most part of the year, statistical producers stay focused on presenting results for a specific domain, and a specific time period, following the same specific quality controls. One might thing "if a thing ain't broken, don't fix it" but this should not prevent statisticians to dedicate time to re-think routines and pursue new best practices.

That is why consideration is being given to changing the actual routine and turn these annual quality reports into a regular model of indicators, ready to be quickly and systematically updated by statistics compilers.

3 EXAMPLES OF REGULAR QUALITY INDICATORS

First and foremost, it must be stressed that this model is a preliminary and non-exhaustive proposal of the SA Unit, still to be thoroughly discussed with the production units prior to its implementation.

In this exploratory study, the ongoing model of regular quality indicators consists of:

- Indicators already produced in annual quality reports (or during the production cycle) and new indicators queued for further implementation;
- Indicators computed with a quarterly frequency, but respecting the periodicity of the underlying statistic/phenomenon (i.e. monthly statistics should have monthly indicators, produced with a quarterly frequency);
- Comparable indicators across domains as well as domain specific indicators.

The model should be divided into seven categories:

– Pre-requisites of quality (PR);
– Accuracy and completeness (AC);
– Plausibility and outlier analysis (PO);
– Reliability and revision studies (RR);
– Consistency (C);
– Timeliness and punctuality (TP); and,
– Accessibility (A).

These categories were inspired by DQAF but adjusted to better fit the statistical domains' idiosyncrasies, and produce more intuitive and measurable results. For each category, a brief explanation and a preliminary, non-exhaustive, sample of indicators is therefore presented (symbols classify the actual status of indicator's performance: ● – already exists; o – to be implemented; ●/o – exists but not in a systematic way).

– Pre-requisites of quality: (i) indicators are in place to evaluate the degree to which legal and institutional environment is supportive of statistics and resources are commensurate with statistical programs and used efficiently; (ii) existing statistics are regularly checked to ascertain whether they can be produced in a more cost-effective way or the burden on reporting agents can be reduced.

Table 1 Pre-requisites of quality indicators

PR1. Number of aborted or failed job runs in IT systems (per month)	o
PR2. Percentage of confidential statistical information series flagged (as at the last reviewing date)	o
PR3. Number of days assigned to data exploration stage (per month)	o
PR4. Number of accesses to databases	●

Regarding PR4. a comprehensive list of granted accesses to statistical databases is validated and updated on a yearly basis, as a control activity within the rules on data confidentiality and to ensure the integrity of information.

– Accuracy and completeness: (i) source data and statistical techniques are sound and statistical outputs sufficiently portray reality; (ii) the largest and most material subset of the required information is available.

Table 2 Accuracy and completeness indicators

AC1. Percentage of estimated non-response	●
AC2. Percentage of adjustments/imputation to stocks at the end of period (breakdown by reporting entity, by country,[5] by institutional sector,[6] by unit records)	o
AC3. Percentage of failed 1st level data checks until the version used in the production stage (breakdown by reporting entity)	o

Data checks referred in indicator AC3. are only applicable to statistics with direct report (i.e. monthly MFI[7] and BOP[8] data) and include, for instance, tests on basic logical identities.

– Plausibility and outlier analysis: (i) the absence of unjustified outliers in data; (ii) values that markedly deviate from the usual pattern of the series are detected, isolated and further analysed.

Table 3 Plausibility and outlier analysis indicators

PO1. Monthly rate of change in stocks/transactions/OCVP[9] greater than X% (breakdown by instrument type, by institutional sector debtor and/or creditor, by reporting entity)	●/o
PO2. Year-on-year rate of change in stocks/transactions/OCVP greater than X% (breakdown by instrument type, by institutional sector debtor and/or creditor, by reporting entity)	●/o

Monthly and year-on-year rates are generally computed during the production cycle, when statisticians validate their first estimates. But the systematic documentation, respecting comparable standards, as well as the calibration of thresholds (X%) by phenomenon, and statistical domain, is still to be defined.

– Reliability and revision studies: (i) revised values of statistic are close to the initial value released; (ii) revisions are tracked and mined for the information they may provide.

Table 4 Reliability and revision studies indicators

RR1. MAPE – Mean Absolute Percentage Error	●
RR2. MARE – Mean Absolute Relative Error	●
RR3. Q – Directional Reliability Indicator	●
RR4. RMSRE – Root Mean Square Relative Error	●
RR5. Bias component	●
RR6. Regression component	●
RR7. Disturbance component	●

[5] As defined by ISO 3166-1 country code.
[6] As defined in ESA 2010.
[7] Monetary and financial statistics.
[8] Balance of payments statistics.
[9] Other changes of volume and price.

These indicators are currently computed by SA Unit for annual quality reports purposes and for Key Risk Indicators' (KRI) monitoring.[10] According to this new paradigm, their inclusion in the model of quality indicators represent an opportunity for statistical compilers to regularly, and almost automatically, compute them, anticipating deviations and mitigating risks at source.

The choice of additional items/balance sheet aggregates to be tested is yet to be discussed with each statistical domain.

– Consistency (logical and numerical coherence, including consistency over time, within datasets, across datasets, and comparisons with external data.

Table 5 Consistency indicators

C1:. First difference of the series between growth rates of change in stocks/transactions/other changes in volume and price (breakdown by instruments, balance sheet items – MFI, or functional categories – BOP)	o
C2:. Difference between EO[11] series and lower and upper threshold of 3% of current account turnover (only applicable to BOP)	●/o
C3:. Cross-checks between main balance sheet items in statistical MFI balance sheet information (BSI) and supervisory data in FINREP[12] (only applicable to MFI)	o
C4:. First difference of the series between goods credits and debits in BOP statistics, and exports and imports in international trade statistics, or between their growth rates (only applicable to BOP)	●/o

In fact, a set of other consistency indicators can be generally defined as "Cn: First difference of the series between prime source (S1) and secondary source (S2)". Whenever this kind of indicator is computed by one statistical domain where S2 becomes S1, the results must be compatible with its "mirror" indicator.

– Timeliness and punctuality (the length of time between its availability and the event it describes; the time lag between the release of data and the target date announced in official release calendar.

Table 6 Timeliness and punctuality indicators

TP1. Punctuality of time schedule of effective publication (in days)	●
TP2. Time lag between the end of reference period and the date of the first/final results (in days)	●

Combining indicator TP2. for timeliness with the number of BP*stat*[13] consultations by statistical domain highlights the relevance of their statistics for users, given the time lag for publication.

– Accessibility (the availability of statistical information to the user, including data and metadata accessibility, and assistance to users.

[10] Revision indicators are based on the report by the joint ECB DG-S/European Commission (Eurostat) Task Force on Quality. See VIOLETTA, D. and AGUILAR, C. P. *Quantitative quality indicators for statistics – an application to euro area balance of payment.* ECB Occasional paper series No. 54, 2006.

[11] Net errors and omissions.

[12] Prudential reporting requirement of financial information enshrined in Implementing Regulation (EU) No. 680/2014, published by the European Banking Authority (EBA).

[13] The "BP*stat*" is a dissemination service of Banco de Portugal that provides statistical information (data and metadata) organised in domains and allowing for both time series and multidimensional exploration.

Table 7 Accessibility indicators	
A1. Number of series disseminated (in BP*stat*)	●
A2. Number of statistical press releases disseminated	●
A3. Number of media content related with statistics published on website (videos, infographics, explainers)	o
A4. Total BP*stat* consultations by statistical domain	●
A5. Number of published news by statistical domain	●
A6. Number of requests for information or clarifications answered, by statistical domain	●
A7. Quality assessment punctuation from data users satisfaction surveys	o

BP*stat* will soon be substituted by a dedicated website (a statistics portal) that will allow for greater user-friendliness and interactivity with the users. At that time, indicator A7. should be implemented with a reasonable periodicity.

What are the next steps? Indicators should be exhaustively characterised, tolerance intervals should be defined and main sources must be selected and prepared for regular computation. Comparable indicators, across statistical domains, should be distinguished from those which are specifically related to one domain. In addition, data owners, responsible for updating indicators, must be assigned.

Further possible developments may include the definition of harmonized rules to generically compare the overall quality of each statistical system. The quality assessment exercise should complement automatic results with casuistic analysis.

Finally, the Statistics Department Board, the SA Unit and the staff of statistical domains should reflect together over the evolution of indicators, and contribute to improve the model.

CONCLUSION – REWARD

Like a carrot and stick method, a good quality indicators' model offers several rewards to data users and providers, to the Statistics Department Board, to intermediate managers and staff.

To data users and providers, this model shows that:

- A robust set of indicators can quickly assess users' changing demand for information and help to deliver tailor-made statistics;
- Successful tests to external consistency might reveal new opportunities to integrate and merge information from different sources, hence reducing the reporting burden to data providers.

To the Statistics Department Board, quality indicators represent:

- A valuable management tool to keep track of key performance indicators (KPI) and key risk indicators (KRI);
- A way to raise awareness to their need to intervene and implement new tools and procedures;
- A key management information when prioritising the investment in IT solutions (software, hardware) and in specialised human resources (training).

From the perspective of statistical domains, a new routine will only be embraced if managers and staff believe in the reward. Their benefits can be listed as follows:

- Intermediate managers will have tools to evaluate the quality of their statistical system and the effort put by their teams;
- Statistical domains are encouraged to continuously monitor the quality of their outputs, rather than answering to quality reports' results on an annual basis;

- The staff becomes able to compare their work with their peers;
- In order to anticipate opportunities for improvement, staff might feel encouraged to reroute the calculation of indicators from published data to acquisition/production databases;
- It ultimately makes processes more efficient, leaving the staff with more time to focus on their core business, data analysis and research.

High quality statistical systems provide for more focused and motivated statisticians craving for high quality statistics.

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