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Working Paper

Quality enhancements in Government Finance Statistics since the introduction of the euro: Econometric evidence

ECB Statistics Paper, No. 26

Provided in Cooperation with:
European Central Bank (ECB)

Suggested Citation: Maurer, Henri; Keweloh, Sascha (2017) : Quality enhancements in Government Finance Statistics since the introduction of the euro: Econometric evidence, ECB Statistics Paper, No. 26, European Central Bank (ECB), Frankfurt a. M.

This Version is available at:
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EUROPEAN CENTRAL BANK

EUROSYSTEM

Statistics Paper Series

Henri Maurer, Sascha Keweloh

Quality enhancements in Government Finance Statistics since the introduction of the euro

Econometric evidence

No 26 / November 2017

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Abstract

This paper reviews the development of the quality of the main fiscal data released through the Excessive Deficit Procedures (EDP) since the euro's introduction. As such, this paper presents the outcome of various econometric tests based on all the vintages of the annual main fiscal data (deficit, change in debt) to assess whether qualitative progress took place over the years. Sound Government Financial Statistics (GFS) data are indeed crucial in the context of the fiscal surveillance carried out in the EU. Therefore, we find it useful to carry out a study responding to former criticisms which pointed out that Member States were beautifying their fiscal data and especially their first notified deficit. It was often assumed that Member States could abuse the initial recording of components which bridge the deficit to the change in debt (the so-called deficit-debt adjustments components).

To assess this qualitative development properly, the study goes beyond the simple description of the revisions. It proposes innovative ways to identify whether each step of the revision is caused by the upward change in deficit. The study also seeks to better identify the datasets which triggered the qualitative progress observed.

JEL codes: H81, M48

Keywords: Excessive Deficit Procedure (EDP), recording of fiscal data; reliability of fiscal indicators; revisions of fiscal data; stock-flow adjustments; fiscal rules and creative accounting

Executive summary

The quality of Excessive Deficit Procedures (EDP) or Government Financial Statistics (GFS) data is a crucial topic in the context of the fiscal surveillance carried out in the EU[1]. This paper presents the results of analytical tests on the development of EDP/GFS data quality since 2001. These tests use the EDP notifications and additional GFS data transmitted in the same period by the NCBs to the ECB, to assess whether the revisions of the fiscal data from 2001 to 2012 reveal any patterns that indicate quality problems or which reveal progress in quality.

The data show large deficit upward revisions in the aggregated euro area in the first years (2001-2006), which are less pronounced later on (2007-2012). This observation confirms initial quality issues presumed by various academic sources in the earliest years of the euro area. The study finds that especially high deficit countries tended to underestimate their deficit in the first transmission of the first period. This study illustrates that these issues have mostly faded away since then.

The progress in the aggregated results for the euro area stems from progress by most euro area countries. As such, the initial quality issues as well as the progress in quality since then are not derived from only one country, even if Greek fiscal data acted as an outlier in terms of the relative important magnitude of upward revisions compared to its own GDP. As illustrated in Table 4, the average annual upward revision of Greek deficit for the years 2007-2012 was of 1,5 % of GDP. The broadly published issue of underrepresentation of the Greek deficit was mainly related to the revised planned fiscal data (as forecasted by the Ministry of Finance) rather than to the actual statistics.

This study adopts an innovative approach by analysing the revisions of the fiscal deficit not only in isolation but within accounting identities where 1) the deficit is equal to fiscal expenditure minus revenue and 2) the deficit is equal to change in debt plus stock-flow adjustment (also known as DDA like deficit-debt adjustment). In particular, the study seeks to identify the origins of the large deficit revisions. The results suggest that the initial deficit quality issues and the subsequent improvement in quality were both related to the quality of expenditure and DDA data.

Moreover, progress in decreasing volatility has been observed in components such as other expenditure, capital expenditure, intermediate consumption and interest payable. These components are more difficult to account for in the initial transmission because of possible incomplete information at an earlier stage which could be used for initial optimist bias. The bigger components such as social payments or compensation of employees (where the source data are usually less fragmented) were already rather stable.

[1] See the EU web-site related to the Stability and Growth Pact (SGP) and the Excessive Deficit Procedure (EDP) – link : (SGP and EDP)

Furthermore, progress has been observed in the robustness of DDA data. Moreover, the data suggest that within the DDA, the main revisions were made during the first period in the 3rd pillar of “time of recording and other differences”. Econometric measures indicate that these revisions were related to the upward deficit revisions in the first period (2001-06) but not in the second one (2007-12). It confirms the opinion that “optimist accrual recording” of fiscal transactions (other accounts receivable for the government) or of expenditure (payables for government) and possible favourable recording of statistical discrepancies might have beautified the initial deficit data in the early stages of the euro area. In the second period in the context of the government interventions during the financial crisis, the “transactions in main financial assets” became the most revised DDA pillar. However, the revisions to the change in debt did not signal any bias, especially in the second period.

As a second novelty, the study analyses the quantitative influence on the deficit revision of two statistical tools that have been set up since 2001 in the framework of the Excessive Deficit Procedure. First, the EDP reservations by Eurostat on the country notifications and second the EDP dialogue visits to the respective EU countries. The analysis shows that these two statistical tools influence significantly the pattern of the deficit revisions. As such, one has to consider whether these factors could be used to estimate the fiscal deficit.

All in all, the various tests used to assess the quality of GFS/EDP data indicate quality improvement in the second period (2007-2012) compared to the first one (2001-2006). They identify in many cases the origins of the bias towards upward deficit revision. Moreover, the tests measure the size of the corresponding revisions in the fiscal deficit (on average an upward revision of 0.1 % of GDP in the second period) which is ultimately of rather limited size compared to revisions for other macro-economic sectors of the economy.

This qualitative progress observed in the GFS/EDP data over the years likely results from the important methodological work carried out by Eurostat together with the national statistical authorities (National Statistical Institutes and National Central Banks) as well as with other stakeholders such as the European Central Bank and the CMFB (Committee on Monetary, Financial and Balance of Payments Statistics). Moreover, various procedures and pieces of legislation related to the fiscal data, its clarification and detailed control processes within the framework of the Excessive Deficit Procedure have been reinforced. These institutional aspects which contributed to the quality of GFS data are not developed further in this document which focuses mainly on the econometrical description of this progress.

1 Introduction and context of the analysis

1.1 General introduction

Within the framework of the Working Group on Government Finance Statistics (WGGFS), it was decided to review the topic of GFS data quality.

The quality of EDP/GFS data is indeed a crucial topic in the context of the fiscal surveillance carried out in the EU. Some academic publications have analysed this topic in detail over the last decade (see References). Few of these publications with explicit titles (for instance "*Empirical evidence on creative accounting with fiscal rules in the EU*"; "*Fiscal Gimmickry in Europe: One-off Measures and Creative Accounting*") hinted at the existence of creative accounting by some Member States to show better fiscal balances than were actually the case.

The sovereign debt crisis and the episode of insufficient robust Greek fiscal data were the two main events which raised public awareness of the quality of EDP and GFS data. The recent progress in the development of fiscal statistics and the reinforcement of the data quality checking procedures has decreased the data quality concerns about GFS charts. For instance, the latest economic literature in the GFS field has shifted towards fiscal transparency and the positive impact of a comprehensive and integrated government balance sheet[2].

This study contributes to the above-mentioned literature in two ways; (i) by expanding the quality analysis to include the most recent available data and (ii) by deepening the quality analysis thanks to the broader database available at the ESCB, to include a larger scope of analysis and additional econometric methods.

This document begins by first providing some context to the analysis (Section 1), followed by the description of the data sources and methods used (Section 2). In Section 3, the main descriptive results of the development of the fiscal revisions are presented. Section 4 investigates the origins of the deficit revisions based on the ad hoc econometric method. Section 5 further documents the specific bias that occurred through accrual accounting and a favourable recording of the statistical discrepancies. Section 6 reports on the quantitative influence from the deficit revisions of two EDP statistical tools consisting of the EDP reservations and the EDP dialogue visits. In Section 7 the link between deficit revisions and the deficit level is analysed. Finally, an epilogue (Section 8) suggests how this study can be further developed.

[2] In his paper released by IMF in 2013 (see item 8 in References), Mike Seiferling re-examined the stock-flow discrepancies of government debt and deficit mentioned of the past studies (see References). He pointed out that the past empirical studies were based on partial measures of the stock-flow residuals. Based on current fully integrated and more comprehensive fiscal data set (e.g. with a distinction between transactions and other flows), the initial conclusions could be partly invalidated.

1.2 Technical note

This paper reviews the quality of fiscal data (deficit and debt) provided by euro area countries in the context of the Excessive Deficit Procedure (EDP)[3] since 2001.

The empirical content is based on the analysis of the EDP data – supplemented by detailed annual GFS data sent by the NCBs to the ECB corresponding to the biannual transmission of EDP data. For the sake of better visualizing the qualitative development of the data, the observation period is divided into two sample periods, the years from 2001 to 2006 and from 2007 to 2012. However the most analytical econometric tests identifying the reasons of upwards revisions of the deficit of euro area countries are compiled from the data of each single transmission (irrespectively of the two periods).

The statistical tests are based on the accounting identity that the net lending (+)/net borrowing (−) of general government (also named "the deficit" or surplus)[4] is identical to the change in Maastricht debt (named "change in debt") *minus* the deficit debt adjustment (DDA):

1. Deficit = Change in debt − DDA

The paper analyses first the quality of the deficit data for the euro area and its member states by comparing the charts provided in the first EDP notification with the charts transmitted in the seven successive notifications.

The analysis is digging further inside the components related to the above mentioned (1) accounting identity in order to identify closely the main sources of revisions.

(a) Revenue and expenditure (as the deficit is the balancing item between both sub-totals)

(b) Revenue and expenditure components (see for instance the breakdown in Table 6

(c) The change in debt

(d) The DDA (as total)

(e) The DDA main components (see for instance the breakdown in Table 7)

The DDA components can be classified in three pillars as illustrated in the Table 1 below, corresponding to different reasons why the deficit is not equal to the change in debt:

[3] Glossary: Excessive deficit procedure (EDP).

[4] The net lending/net borrowing in the government accounts is defined closely in the European system of accounts (ESA 2010) under the par. 20.112 and following. At short, this balancing item (B.9) is the difference between total revenue and total expenditure of general government.

2. DDA = (A) Net transactions in main financial assets + (B) Valuation effects and other changes in volume of debt and (C) Time of recording and remaining factors.

A separate paper will explore in closer details the DDA components and how to use a DDA analysis as a tool spotting possible qualitative data issues. For this current econometrical paper focusing on the upwards revisions of the deficit, one has only to understand that for an unchanged debt, any revision of the deficit (the so called "non-financial balance") leads to a symmetrical revision in financial accounts recorded within the DDA components. Conversely the revision of a DDA component could lead (for a given debt) to a revision of the deficit.

The DDA components regarded as prone to revisions are mainly those of the pillar C (see Table 1) related to "time of recording and remaining factors". The reason is that the time of recording principle prevailing for the recording of economic flows under the European system of accounts (ESA 2010) is the accrual basis. Under this principle, the time of recording is when economic value is created or extinguished, or when claims and obligations arise or are cancelled.

At contrary, the initial sources provide cash data before a transformation into accrual basis. In some cases, the accrual recording is compiled from time adjusted cash data for which the last month(s) is not entirely available when the Member State is sending the EDP Spring notification. As an example the accrued taxes are part of the revenue and indirectly of the deficit of the year t. The time adjusted cash data to record the due accrued taxes in year t are partly collected in the first month(s) of the year $t+1$. The accrued taxes (revenue) might correspond in financial accounts to amounts deposited at the Treasury and remaining share still partly unpaid. When the due accrued taxes (based partly on projections) or the "other accounts payable/receivable" is revised later on, it would lead to further revision(s) of the deficit in the year t. When the accrual principle in accountings is misused to beautify the deficit of government, one may call it: "*optimistic accrual accounts*" or when later revised upwards: "*optimist bias*".

Table 1

DDA components classified into 3 pillars

PILLARs of DDA	(A) Net transactions in main financial assets	(B) Valuation effects and other changes in volume of debt	(C) Time of recording and remaining factors
Examples	Government issues debt securities to finance the acquisition of equities.	Debt is measured in face value but its issuance or redemption may be below or above par.	Accrued taxes are recorded as revenue, while part of it is still unpaid (other accounts receivable for government).
	Government disposes of financial assets to redeem debt instruments.	Debt is measured in the national currency but the changes in exchange rates modify the value of the debt denominated in foreign currency.	Military airplanes are delivered to government, but only tranche of this delivery is paid (other accounts payable for government not recorded in Maastricht debt).
	The Treasury issues debt to invest in the financial portfolio of the Social Security Funds.	A reclassification of unit to or from the general government sector implies a change in the Maastricht debt.	Due to differences in data sources there are statistical discrepancies between non-financial and financial accounts.

2 Sources and methods used for the quality analysis of GFS data

2.1 Data sources

The public discussion about the quality of fiscal data since the introduction of the euro is based on the official notified EDP fiscal data (deficit and debt) as released twice a year by Eurostat (i.e. spring and autumn press releases[5]). Each EDP notification covers the two key elements of fiscal data (i.e. deficit and debt) of the past year as well as the three previous years[6]. The first dataset used for this study comprises eight data vintages of the fiscal data as published in the EDP press releases for the 2001-2012 period (for 2012 only 7 vintages are available in spring 2016).

The second source of data is the GFS fiscal data transmitted by the NCBs to the ECB in the context of the ECB GFS Guideline and additional voluntary data. As these data are a sub-set of the fiscal data consistent with the EDP deficit and debt, they provide further details on the deficit (through the components of revenue and expenditure), the change in debt and components of deficit-debt adjustment. Provided that GFS data are transmitted in parallel with the EDP notification and that all the vintages are stored in the ECB data bank, the 8 vintages of the EDP fiscal data coincide with the equivalent vintages of annual GFS[7].

More technically, the deficit in t_i is defined as the deficit in year t in the GFS transmission corresponding to the ith EDP notification covering data of the year t. Accordingly, the deficit in t_1 is the deficit in year t as reported in the first (initial) transmission and the deficit in t_8 is the deficit in year t as reported in the eighth and final EDP notification. Other variables are defined in a similar way. We call the revision from the first to the eighth and final notification, from t_1 to t_8, the total revision and the revision from one notification to the following notification, from t_i to t_{i+1}, a single revision. The aggregated revision refers to the aggregated euro area's total or single revision and a country revision refers to a country's total or single revision. The volatility of the revisions is calculated as the sum of the absolute value of the revisions.

5 See for instance the latest EDP press release of April 2017

6 The full set of data needed to compile the EDP data (non-financial data, financial data and data related to the debt) is often compiled by different statistical authorities National Statistical Institutes (NSI), National Central Banks (NCBs) and Ministry of Finance (MoF) that should co-operate through the coordination by NSI to present consistent EDP notifications tables.

7 For the very few missing data, extrapolation between 2 vintages is used.

2.2 Framework of analysis

The study assumes that the data that are the most revised are weaker in terms of data quality. Moreover, biased revisions (i.e. revisions always in the same direction) are a further sign of weak or even data which have been positively misrepresented on purpose. This assumption is realistic in the framework of the EDP context where the fiscal data have been scrutinised since the euro's introduction through numerous tools, checking procedures and institutional arrangements (e.g. clarification of EDP notification, EDP dialogue visits, etc.).

In our approach we consider the 8th vintage of deficit and debt as the final and correct statement of the fiscal status of the respective country[8].

The starting point of the analysis is the revision of the deficit that has been regarded de facto until now[9] as the most critical variable within the assessment of the EDP. The revised fiscal data are analysed within the accounting identity, which equals the deficit with the change in debt plus the deficit-debt adjustment (DDA). In order to respect the accounting identity, a deficit revision leads either to a revision of the change in debt or to a revision of the DDA (or to a combination of both). Furthermore, a deficit revision needs to be prompted by revenue or by an expenditure revision (or by a combination of both). In some cases, the analysis is performed further at the level of each DDA pillar – (i) the main financial transactions; (ii) the valuation effects and other changes in volume; (iii) the time of recording (including the statistical discrepancies) and at the level of the expenditure and revenue components.

Unless specified differently, all values are presented as a percentage of the aggregated euro area GDP and, in order to exclude the influence of the GDP revisions, the GDP selected was the one available in the latest EDP notification. Therefore, all fiscal data in a given year t are denominated by the GDP of the year t as it was reported in the latest EDP notification.

In the existing raw dataset on fiscal data, the following technical difficulties in deriving the appropriate measurements have been addressed as follows:

1. *Change in accounting system from ESA95 to ESA 2010*

The EDP/GFS database contains a major break in September 2014 when the accounting system changed from ESA95 to ESA 2010.

At that moment, the annual fiscal data of 2013 were released for the first time and the autumn EDP notification covered annual data from 2010 onwards. In this study, the impact of this break in the transmission of September 2014 has been neutralised by excluding this specific revision for all the annual fiscal data corresponding to 2010 and later. Hence based on the method of “8 vintages per fiscal data”, the deficit and

[8] The analysis of the successive vintages of the EDP fiscal data show indeed that the successive revisions are decreasing. For a given recording methodology, the fiscal data after 4 years (8 vintages) are much closer to the latest revised data in the ongoing revised GFS database.

[9] See the last EB article (May 2016) which also calls for consideration of the debt criteria in SGP:

debt data up to 2010 were not impacted at all by this accounting break. The corresponding fiscal data have then only 6 revisions in addition to the initial transmission (1 less than the annual data before 2010).

2. *Euro area aggregate (EA12) since 2001*

The main focus of the study is to assess the development of the GFS data quality for the euro area since the euro's introduction (2001). Therefore, the countries that were not yet in the euro area at that time are not included in the main aggregate “euro area 12” (EA12) because they lack the 8 vintages of fiscal data expressed in euro since 2001. In 2015, this EA12 aggregate represented almost 98% of the GDP of the current euro area (EA19) which can be considered a representative sample of the euro area within the framework of the study. The fiscal data of the 7 other remaining participating countries have also been stored since the year they joined. They could be used for complementary country analysis.

3 Revisions: 2001-2006 vs. 2007-2012

This section presents the deficit, expenditure, revenue, DDA and Δdebt revisions from 2001 to 2006 compared to 2007 to 2012.[10] By comparing these two periods, the GFS quality development over time is becoming more visible. The main focus is on the aggregated, total revisions (the aggregated euro area revision from t_1 to t_8), which is in this chapter abbreviated by the revision. The only exception is Section 3.1.2 which focuses on the aggregated, single revisions and Section 3.1.3 which focuses on the country, total revision.

3.1 Deficit revisions

The first period is characterised by continuous and large deficit upward revisions. The deficit revisions declined in the second period. This pattern indicates a quality issue in the first period and a quality improvement in the second period. Similar patterns can be found in most EA12 countries. Moreover, in the second period the first single deficit revision from t_1 to t_2 is a sound indicator of the total deficit revision from t_1 to t_8.

3.1.1 Aggregated EA12 deficit revisions

The deficit revisions can be seen in Chart 1 and the averages are summarised in Table 2. In the first period the average revision was 0.27% of GDP. This value is almost three times higher than the average revision of 0.11% of GDP within the second period. Moreover, the highest deficit upward revision decreased from 0.59% of GDP in the first period (in 2001) to 0.21% of GDP in the second period (in 2008). The large upward revisions in the first period indicate a deficit quality issue whereas the decreasing deficit revisions in the second period indicate a quality improvement. The quality improvement is reinforced by the fact that the average deficit in the context of the financial crisis was higher in the second period (3.8% of GDP as opposed to 2.4% for the first period). All things equal to a period of higher deficit might lead to higher revisions (see also the development of this topic under the Section 7).

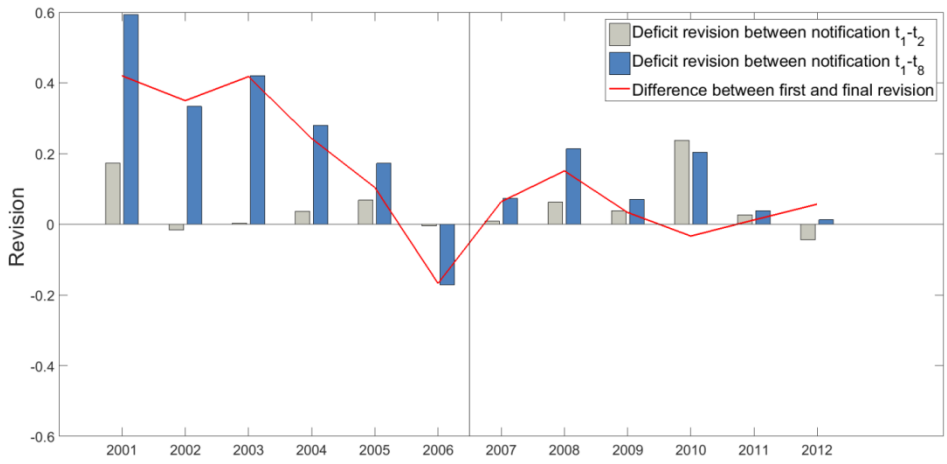
[10] The first period from 2001-2006 has 504 observations (twelve countries, six years and seven revisions per year and country). The second period 2007-2012 has 456 observations (twelve countries, six years and seven revisions per year, minus 36 observations missing due to the change from ESA95 to ESA2010 and 12 missing observations due to the 8th vintage of 2012 data not yet being published – autumn 2016)

3.1.2 Breakdown by vintage

This section analyses the aggregated EA12 revisions between different vintages and all mentioned revisions are aggregated EA12 revisions. Chart 1 also compares the total deficit revisions (from t_1 to t_8) to the first single deficit revision (from t_1 to t_2) and Table 2 also contains a comparison between the average revisions of different vintages in both periods. For the first period, the average first single deficit revision was 0.05% of GDP and thus just around 15% of the total revisions. The successive single revisions from t_i to t_{i+1} between both t_2 and t_5 and t_5 and t_8 on average also equalled almost one eighth of the total revision. Therefore in the 2001-2006 period, all single revisions t_i to t_{i+1} contributed almost equally to the total deficit revision of 0.27% of GDP. By contrast, in the second period the first single deficit revision was on average 0.05% of GDP, which is already 50% of the average total deficit upward revision.

Chart 1

Euro area deficit revisions (in % of GDP) between different vintages



Source: ECB calculations on Eurostat data.
Note: Aggregated EA12 deficit revision from t_1-t_2 and t_1-t_8.

Table 2

Average euro area deficit revisions between different vintages

	2001-2006	2007-2012
Average deficit in t_1 (initial transmission)	**2.10%**	**3.70%**
Average deficit revision		
(i) t_1 to t_2	Δ + 0.05%	Δ + 0.05%
(ii) t_2 to t_5	Δ + 0.12%	Δ + 0.01%
(iii) t_5 to t_8	Δ + 0.11%	Δ + 0.04%
Average deficit revision t_1 to t_8 (highest deficit revision t_1 to t_8)	**Δ + 0.27%** (Δ + 0.59% in 2001)	**Δ + 0.11%** (Δ + 0.21% in 2008)
Average deficit in t_8 (final transmission)	**2.37%**	**3.80%**

Source: ECB calculations on Eurostat data.
Note: The table shows the average of the aggregated EA12 deficit revision between 2001 and 2012 during different vintages.

Table 3 confirms the results derived for the aggregated EA12. It shows that the first single deficit revision underestimated the total deficit revision in the first period and it is closer to the total revision in the second period. Moreover, the first single revision can explain between 41 and 47 percent of the variation of the total deficit revision in the first period and between 69 and 71 percent in the second period.

Therefore, the first single deficit revision from t_1 to t_2 became for the period 2007-2012 a good indicator of the total deficit revision from t_1 to t_8.

Table 3

Deficit revisions t_1-t_8 vs. t_1-t_2

$d_{t_1-t_8,t,c} = b_0 + b_1\, d_{t_1-t_2,t,c} + e_{t,c}$		Specification 1	Specification 2
Countries		EA12	EA12
Number of observations		72	72
Denominator		Country GDP	average EA12 GDP
01-06	b_0	0.15	0.01
	[P-Value]	[0.00]	[0.01]
	b_1	1.92	1.84
	[P-Value]	[0.00]	[0.00]
	R^2	0.47	0.41
07-12	b_0	0.03	0.00
	[P-Value]	[0.22]	[0.11]
	b_1	1.54	0.90
	[P-Value]	[0.00]	[0.00]
	R^2	0.73	0.69

Source: ECB calculations.
Note: This table shows the regression $d_{t_1-t_8,t,c} = b_0 + b_1\, d_{t_1-t_2,t,c} + e_{t,c}$ with t_1-t_8 is equal to the revision from t_1 to t_8 and t_1-t_2 is equal to the revision from t_1-t_2 in year t and country c.

3.1.3 Breakdown by country

This section analyses a breakdown by country of the total country revisions. Table 4 contains the breakdown of the average deficit revisions from t_1 to t_8 by country in percent of the country's GDP and the countries' contribution to the average total, aggregated EA12 deficit revision. Moreover, all single deficit revisions of each EA12 country in percent of the EA12 GDP are included in the annex in Chart 3.1(4a). The average total upward revision of the EA12 deficit in the first period was shared by almost all countries (except Luxembourg and Finland), though on a different scale. Equally, the progress recorded for the second period with decreasing total deficit revisions was observed in many EA12 countries. Only Portugal experienced a substantial worsening of the deficit in the subsequent revisions compared to the first period. Greece was able to halve its total deficit upward revisions which reach 1.5% of GDP in the second period. The aggregated, total EA11 (EA12 without Greece) deficit revision in the first period was 0.20% of GDP in the first period and 0.07% of GDP in the second period. Therefore the aggregated deficit quality issues and improvements can still be observed for the EA11. The aggregated EA12 deficit revisions were mostly influenced by Italy, Greece, Germany and Spain in the first period and by Germany, Greece, Spain and Italy in the second period.

Table 4

Deficit revisions in euro area countries (comparing periods 2001-2006 & 2007-2012)

	Average deficit revision t_1 to t_8 (% of country's GDP)	Contribution to EA12 deficit revision in 2001-2006	Average deficit revision t_1 to t_8 (% of country's GDP)	Contribution to EA12 deficit revision in 2007-2012
BE	0.51%	7%	-0.01%	0%
DE	0.11%	12%	0.14%	37%
IE	0.02%	0%	0.14%	2%
GR	3.27%	26%	1.52%	36%
ES	0.20%	8%	0.28%	30%
FR	0.03%	3%	-0.03%	-6%
IT	0.51%	34%	-0.10%	-15%
LUX	-0.73%	-1%	-0.90%	-4%
NL	0.17%	4%	0.03%	2%
AT	0.65%	7%	0.18%	5%
PT	0.34%	2%	0.65%	11%
FI	-0.12%	-1%	0.05%	1%
EA12	0.27%	100%	0.11%	100%

Source: ECB calculations on Eurostat data.
Note: The table shows the average total, country deficit revision between 2001-2006 and 2007-2012. The contribution to the EA12 deficit revision is equal to the average of the countries' deficit revision in percentage of the EA12 GDP divided by the average EA12 deficit revision.

3.2 Expenditure and revenue revisions

This section presents the aggregated, total revenue and expenditure revisions. By definition, deficit revisions need to be due to revenue or expenditure revisions. However, a revenue revision could also be related to an expenditure revision with no impact on the deficit.[11] The aggregated, total revision is the sum of multiple single revisions, which could partly cancel each other out. Therefore the aggregated, total revisions should not be used to derive conclusions about the origins of the deficit revisions. Hence all revisions are analysed in isolation and an approach to identifying the origins of the deficit revisions is presented in Section 4.

Expenditure was revised upwards in both periods, whereas revenue revisions changed from downward to upward revisions. Moreover, the volatility of revenue and expenditure revisions and the revisions of most of their components decreased in the second period. In particular, small expenditure and revenue components were very volatile compared to its size in the first period, but less volatile in the second period.

3.2.1 Aggregated EA12 expenditure and revenue revisions

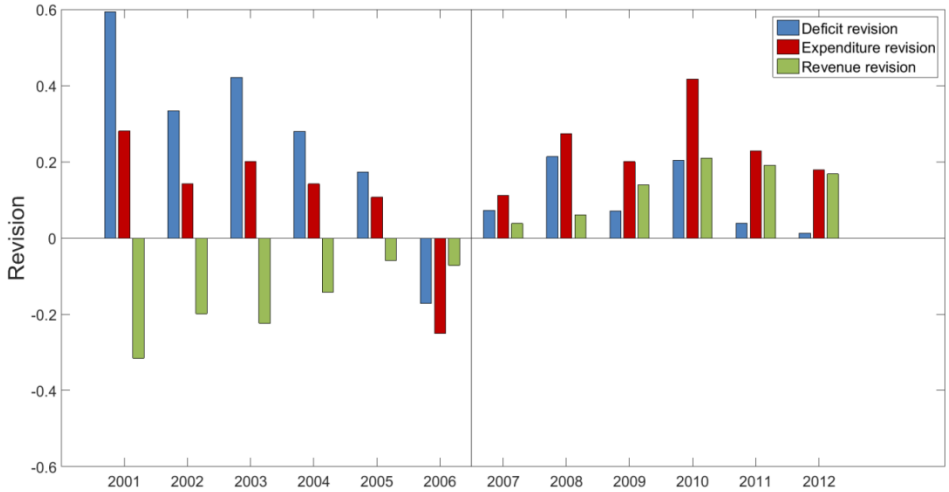
Chart 2 shows the aggregated, total revenue and expenditure revisions and Table 5 summarises the average revisions and volatilities in both periods. The average

[11] A revenue revision related to an expenditure revision could be due to reclassifications with an impact on revenue and expenditure or due to consolidation issues.

expenditure revision increased from 0.10% of GDP in the first period to 0.25% of GDP in the second period. This increase is mainly due to the outlier year of 2006. Excluding the outlier, expenditure was always revised upwards by approximately 0.20% of GDP. The average revenue revision was −0.17% of GDP in the first period and increased by 0.31 percentage points to 0.14% of GDP in the second period. Moreover, in the second period the volatility of revenue and expenditure revisions decreased by almost 50%.

Chart 2

Euro area deficit, expenditure and revenue revisions



Source: ECB calculations on ESCB and Eurostat data.
Note: Aggregated EA12 deficit, expenditure and revenue revision from t_1-t_8.

3.2.2 Breakdown of expenditure and revenue revisions

Table 5 also contains a breakdown of expenditure and revenue revisions at the level of the components that have been tested separately. Capital revenue accounts for about 1% and current revenue for almost 99% of the total fiscal revenue of EA12. However, the volatility of capital revenue revisions is 0.31, which is more than 50% of the volatility of current revenue revisions. Also, other relatively “small” components such as current expenditure, intermediate consumption, other current expenditure and capital expenditure were subject to volatile revisions in the first period and volatility decreased in the second period.

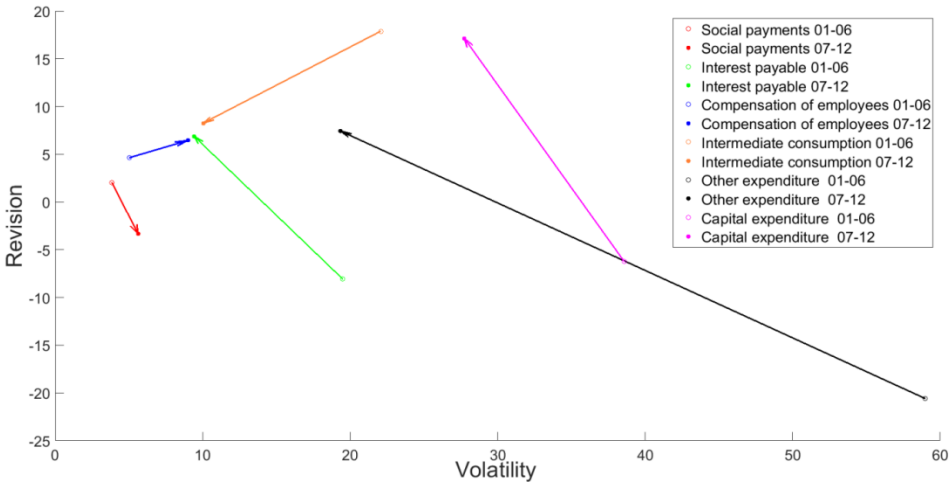
To account for the size of the components, Chart 3 shows the relative revisions vs. the relative volatility of the expenditure components of the aggregated EA12 (and Chart 3.2(2b), included in the annex, of each single EA12 country). The revisions are denominated by the size of the first transmission of a given variable and not by GDP. The charts compare the volatility and revisions in the first period to the second period. Progress has been observed over the two periods through a significant decrease in volatility in components such as other expenditure, capital expenditure, intermediate consumption and interest payable. These annual components are usually difficult to account for in the initial EDP/GFS transmission of April succeeding the events because of possible incomplete information at an earlier stage (for

instance about the aggregated public investments at all levels of general government). This status could be used in GFS/EDP for initial optimist bias.

The bigger components such as social payments or compensation of employees (where the source data is usually very centralized) were already rather stable in the 1st period. The slight but not significant change in the deficit revisions of these two variables plays a bigger role than the aggregated expenditure due to their relative weight (see Table 5 and the annex). Except for the variable of capital expenditure that still needs to improve in term of revisions (bigger impact on upward revision in the 2nd period), the five other variables have improved or mainly stabilised the impact on deficit revision.

Chart 3

Expenditure: relative revision vs. relative volatility of revisions (in %) – comparing periods 2001-2006 vs. 2007-2012



Source: ECB calculations on ESCB data.
Aggregated EA12 revisions from t_1 to t_8 in percent of the variable's first transmission. The volatility equals the aggregated absolute EA12 revision from t_1 to t_8 in percent of the variable's first transmission. More details on all EA12 countries are included in the annex.

Table 5

Average euro area deficit, expenditure and revenue revisions (in % of GDP)

	2001-2006			2007-2012		
	average transmission t_1	average revision t_1-t_8	Volatility*	average transmission t_1	average revision t_1-t_8	Volatility*
Deficit	2.13	**0.27**	0.52	3.70	**0.11**	0.44
Revenue	45.55	**-0.17**	0.64	44.56	**0.15**	0.35
Current revenue	45.02	**-0.14**	0.61	44.14	**0.14**	0.33
Direct taxes	11.80	**0.01**	0.08	11.83	**0.15**	0.22
Indirect taxes	13.61	**-0.14**	0.26	12.81	**-0.25**	0.38
Net social contributions	15.58	**0.03**	0.14	15.37	**-0.01**	0.13
Other current revenues	4.02	**-0.04**	0.44	4.13	**0.25**	0.33
Capital revenue	0.53	**-0.03**	0.31	0.43	**0.01**	0.08
Expenditure	47.68	**0.10**	0.90	48.27	**0.26**	0.56
Current expenditure	43.76	**0.15**	0.63	44.51	**0.14**	0.35
Social payments	22.25	**0.08**	0.30	23.13	**-0.14**	0.30
Interest payable	3.34	**-0.05**	0.17	2.92	**0.04**	0.09
Compensation of employees	10.32	**0.08**	0.17	10.29	**0.12**	0.22
Intermediate consumption	4.80	**0.14**	0.33	5.29	**0.08**	0.21
Other expenditure	3.06	**-0.10**	0.46	2.87	**0.04**	0.20
Capital expenditure	3.92	**-0.04**	0.49	3.76	**0.12**	0.33

Source: ECB calculations.
Note: EA12 average transmission t_1, aggregated, total revision t_1-t_8 and volatility during the period 2001-2006 and 2007-2012 in percentage of EA12 GDP. * The volatility is calculated as the sum of all absolute revisions in the given period.

3.3 DDA and Δdebt revisions

This section presents the DDA and Δdebt revisions. Considering the accounting identity: "Deficit = Δdebt minus DDA", a deficit revision needs to be accompanied by a DDA or Δdebt revisions. Analogous to Section 3.2, the aggregated total revisions of DDA or debt do not reveal the origins of the deficit revisions. Therefore, all revisions are first analysed in isolation. Second, an approach to identifying the origins of the deficit revisions is presented in Section 4.

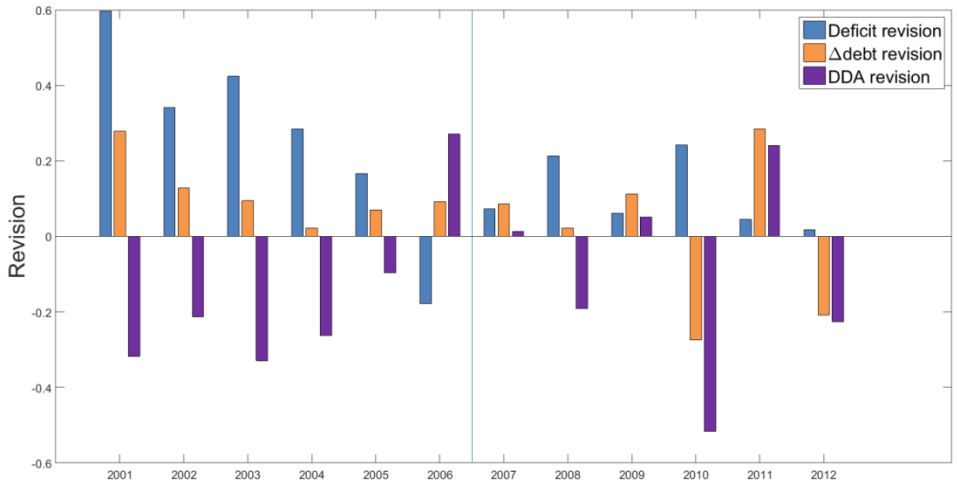
In the first period Δdebt revisions were biased upwards and DDA revisions were biased downwards. These biases decreased in the second period. The DDA pillar *time of recording and other differences* was the most revised pillar in the first period. In the second period the DDA pillar *transactions in main financial assets* became the most revised pillar. Moreover, the first period was characterised by many revisions inside the DDA pillars without any effect on the overall DDA revisions.

3.3.1 Aggregated DDA and Δdebt revisions

Chart 4 shows the aggregated, total DDA and Δdebt revisions and Table 6 summarises the average revisions in both periods.

Chart 4

Euro area deficit, Δdebt and DDA revisions (in % of GDP)



Source: ECB calculations.
Note: Aggregated EA12 deficit, expenditure and revenue revision from t_1-t_8.

Table 6

Average euro area deficit, Δdebt and DDA revisions (in % of GDP)

	2001-2006			2007-2012		
	average transmission t_1	average revision t_1-t_8	Volatility*	average transmission t_1	average revision t_1-t_8	Volatility*
Deficit	2.13	**0.27**	0.52	3.70	**0.11**	0.44
Δdebt	2.35	**0.11**	0.32	5.18	**0.00**	0.40
(-)DDA	-0.22	**0.16**	0.62	-1.48	**0.10**	0.66
(-)TMFA	-0.11	**-0.04**	0.77	-1.69	**0.22**	0.61
(-)Transactions in currency	-0.08	**-0.02**	0.19	-0.35	**0.06**	0.23
(-)Transactions in debt securities	-0.12	**-0.00**	0.16	-0.37	**0.06**	0.27
(-)Transactions in loans	-0.00	**0.02**	0.30	-0.00	**0.09**	0.21
(-)Transactions in equity	0.06	**-0.05**	0.54	-0.34	**0.01**	0.27
(-)OCV&VE	0.02	**0.07**	0.40	0.22	**-0.03**	0.22
(-)TOR&SD	-0.12	**0.13**	0.98	-0.01	**-0.08**	0.60
(-)Statistical discrepancy	0.08	**-0.12**	0.86	0.01	**-0.02**	0.23
(-)Transactions in other assets	0.04	**0.02**	0.57	-0.19	**-0.06**	0.45
(-)Transactions in other liabilities	-0.23	**-0.04**	0.71	-0.14	**-0.00**	0.50

Source: ECB calculations on ESCB data.
Note: Aggregated EA12 average transmission t_1, aggregated, total revision t_1-t_8 and volatility during the 2001-2006 and 2007-2012 periods in percentage of EA12 GDP.
* The volatility is calculated as the sum of all absolute revisions in the given period.

The average change in debt revision in the first period was 0.11% of GDP and it declined to 0.01% of GDP in the second period. Moreover, in the first period, the change in debt revisions was always positive. In the second period they were positive in four out of six years. This alternating sign in the second period explains the decline of the average change in debt revision and the slight increase its volatility.

In the first period the average DDA revision was −0.16% of GDP and it declined (in absolute value) to −0.10% of GDP in the second period. A combination of "DDA downward revision" and "deficit upward revision" took place almost throughout the entire 2001-2006 period (in 2001, 2002, 2003, 2004 and 2005) while it appeared only at random for the 2007-2012 period (in 2008, 2010 and 2012). The volatility of the DDA was high in both periods.

3.3.2 Breakdown of DDA pillars

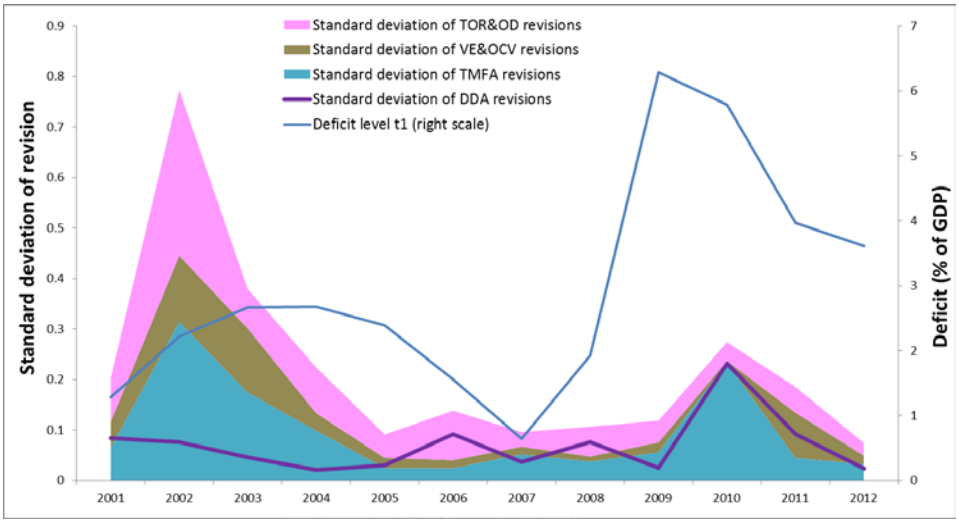
Table 6 also shows the breakdown of the average aggregated, total DDA revisions into the revisions of the three pillars; *transactions in main financial assets* (TMFA), *valuation effects and other changes in volume of debt* (VE&OCV) and *time of recording and other differences* (TOR&OD). Chart 5 compares the DDA revision's standard deviation to the standard deviation of its pillars.

In the first period the average DDA downward revision of −0.16% of GDP can be broken down into a TOR&OD downward revision of −0.13% of GDP, a VE&OCV downward revision of −0.07% of GDP and TMFA upward revision of 0.04% of GDP. Moreover, TOR&OD had the highest volatility in the first period. In the second period the composition changed and the TMFA was revised downwards by −0.17% of GDP, whereas the VE&OCV as well as the TOR&OD were revised upwards by 0.02% and 0.07% of GDP. Moreover, TMFA had the highest volatility in the second period. Hence, TOR&OD was the most revised pillar in the first period and TMFA was the most revised pillar in the second period.

Moreover, Chart 5 shows that the first period was characterised by large revisions inside the DDA pillars without any effect on the overall DDA revisions. The high number of revisions inside the DDA can be identified due to the large difference in the first period between the sum of the standard deviations of the DDA's pillars and the standard deviation of the DDA itself. In the second period the difference declined, which indicates fewer revisions inside the DDA.

Chart 5

The standard deviation of the DDA and its pillars



Source: ECB calculations.
Note: The standard deviation is calculated from the single revisions observed in each reference year.
Since DDA=TMFA+VE&OCV+TOR&OD, a difference between the sum of the standard deviations of the pillars and the standard deviation of total DDA indicates a negative covariance between the revisions of the pillars, i.e. the revisions of each pillar partly offset each other.

4 The origins of the deficit revisions

In the previous section a quality issue due to high deficit revisions was identified in the first period and a quality improvement due to moderate deficit revisions was observed for the second period. Moreover, the revisions of the data on expenditure, revenue, DDA and Δdebt were analysed (mainly comparing the respective values between t_1 and t_8) but in isolation. In this section the focus is on analysing how the revisions of these variables were related to deficit revisions within the respective accounting identities of deficit. We find evidence that the deficit quality issues in the first period and the quality improvements in the second period were both related to expenditure and DDA revisions. In particular both current and capital expenditure contributed to the quality issues in the first period. The largest quality improvement was found for the current expenditure data in the second period.

4.1 Approach to identifying the origins of the deficit revisions

The aggregated total revisions, analysed in Section 3, can be misleading if one wants to draw conclusions about how the revisions were related to each other (in an accounting identity). In particular, we would like to know which variables were related to the deficit revisions and thus led to the deficit quality issues and improvements.

The following example illustrates the above-mentioned problem. Say the total revision is deficit +100, expenditure +10, revenue −90. A first rapid (and incorrect) interpretation of the total revision would indicate that the expenditure revision increased the deficit by 10 and the revenue revision increased the deficit by 90. This interpretation implies that no expenditure revision was related to revenue revisions. More precisely it implies that the total revision is the sum of two single revisions; (i) deficit +10, expenditure +10, revenue +/−0 and (ii) deficit +90, expenditure +/−0, revenue −90. However, this is only one out of many combinations of two single revisions which would add up to the total revision. Another possibility would be (i) deficit +/−0, expenditure −90, revenue −90 and (ii) deficit +100, expenditure +100, revenue +/−0. In this case, one would conclude that expenditure revisions increased the deficit by 100 and revenue revisions had no influence on the deficit.

The problem of lost information on the origins during the aggregation process, the aggregation from countries to euro area and from single to total revisions, can be overcome by first identifying the origins of the deficit revisions at the level of the single country revisions (the smallest level of aggregation) and afterwards only aggregating the revisions identified as related to deficit revisions.

Our approach to identifying the single revisions can be summarised as follows:

1. If a single, country revenue revision can explain more than a defined X% of the single, country deficit revision, the revenue revision is identified as related to (or the origin of) the deficit revision. Accordingly, if we observe a single, country

revision like deficit +100, expenditure +10, revenue −90, we would identify it as a deficit revision due to a revenue revision.

2. Similarly, if a single, country expenditure revision can explain more than a defined X% of the single, country deficit revision, the expenditure revision is identified as related to (or the origin of) the deficit revision. Accordingly, if we observe a single, country revision such as deficit +100, expenditure +90, revenue −10, we would identify it as a deficit revision due to an expenditure revision.

3. If a single, country revenue revision can explain more than X% of the single, country expenditure revision, the revenue revision is identified as related to the expenditure revision. Accordingly, if we observe a single, country revision such as deficit −10, expenditure −100, revenue −90, we would identify it as a revenue revision related to an expenditure revision (for instance, in case dominated by a consolidation issue or shift of entities which modify through a single, country revision both the expenditures and revenues of the same or similar scale).

4. If neither of these cases is true, the revision is not identified. Accordingly, if we observe a single, country revision like deficit 100, expenditure 50, revenue −50, it is not possible to identify its origin.[12]

For the defined threshold X we chose the value of 70%. Further results are appended in the annex for the respective thresholds of X=80% and X=60%. The conclusions are robust to these changes.

At the second stage, the single, country revisions identified in group 1), 2), 3) or 4) are aggregated. These four aggregates break down the aggregated, total deficit revision into the 4 identified groups. Specifically: 1a) the estimated aggregated, total deficit revision due to revenue revisions, 2a) the estimated aggregated, total deficit revision due to expenditure revisions, 3a) the residual aggregated, total deficit revision and 4a) the unidentified aggregated, total deficit revision. The result of this extensive breakdown is shown in the annex.

The following presentation will be simplified by excluding the residual group 3a) and the unidentified group 4a). Through proportionate extrapolation 1a) plus 2a) equals the average aggregated, total deficit revision in the given period. This approach could be further fine-tuned. So far, it is only the first attempt to give a best estimate of the origins of the deficit revisions[13].

[12] Unfortunately, the single, country revisions are also the sum of multiple revisions and the same problem described for the aggregated, total revisions could theoretically apply to the single revisions too. However, if one assumes that the probability of a large revision in a single, country revision is small, then the identification in case 1) and 2) seems to be plausible since it implies that the single, country revision is the sum of one large, dominating revision and one small revision which is more likely than the sum of two large revisions which partly cancel each other out.

[13] In the remaining part of Section 4, the average of the estimated and extrapolated aggregated total revision due to the “revision x” is abbreviated by the estimated revision due to the “revision x”.

4.2 Deficit vs. expenditure and revenue revisions

Table 7 summarises the estimated deficit revision due to revenue and expenditure revisions in the first and second period. More detailed tables and charts (including information on 3a), 4a) and the number of identified single revisions) are in Annex 4.2.

Table 7

Average deficit revisions due to expenditure and revenue revisions

	2001-2006	2007-2012
Deficit	0.27%	0.11%
Expenditure [~Deficit]	0.10% [0.29%]	0.25% [0.14%]
Revenue [~Deficit]	-0.17% [-0.01%]	0.14% [-0.03%]

Note: Average aggregated, total EA12 deficit, expenditure and revenue revisions. The numbers in brackets show the identified average deficit revisions related to revenue or expenditure revision, extrapolated such that the average expenditure revisions related to deficit revisions minus the average revenue revisions related to deficit revisions are equal to the average deficit revision. The (not extrapolated) identified average deficit revisions related to revenue or expenditure revision are shown in the annex in Table 4.2(1b) with an identification threshold of 70%.

In the first period 48 single, country deficit revisions were identified as related to revenue revisions (case 1a), 96 single, country deficit revisions were identified as related to expenditure revisions (case 2a), 125 single, country deficit revisions corresponded to residual revisions (case 3a) and 235 single, country revisions remained unexplained (case 4a). The expenditure revisions explain the majority of the deficit upward revisions, whereas the impact of revenue revisions on the deficit is cancelled out (sometimes increasing, sometimes reducing the deficit). In particular, the estimated deficit revision due to expenditure revisions is +0.29% of GDP in the first period.[14] Therefore one can conclude that the deficit quality issue, i.e. the large deficit upward revisions, was related to an expenditure quality issue.

Similarly, in the second period 55 single, country deficit revisions were identified as related to revenue revisions, 86 single, country deficit revisions were identified as related to expenditure revisions, 66 single, country deficit revisions corresponded to residual revisions and 249 single, country revisions remained unexplained. The expenditure revisions still explain the majority of the deficit upward revisions and the impact of revenue revisions on the deficit again is cancelled out. However, the estimated deficit revision due to expenditure revisions decreased by 0.14 percentage points. Therefore the deficit quality improvement, i.e. the decreasing deficit revisions, was also due to an improvement in the quality of expenditure data.

[14] The (not extrapolated) estimated deficit revision due to expenditure revisions was 0.16% of GDP and the (not extrapolated) estimated deficit revision due to revenue revisions was −0.01% of GDP, see Annex Table 4.2(1b). Therefore, the identified deficit revision due to expenditure and revenue revisions is 0.17% of GDP, which is 63% of the deficit revision of 0.27% of GDP. The extrapolated results are multiplied by 1/0.65=1.59 in order to derive a deficit revision due to expenditure and revenue revision which is equal to the observed deficit revision of 0.27% of GDP.

Table 8 shows the breakdown of expenditure revisions and their estimated influence on the deficit revisions.[15] A similar table showing the breakdown of revenue revisions is included in the annex. In the first period, the estimated deficit revision due to expenditure revision of 0.29% of GDP is equally divided between the estimated deficit revision due to current expenditure (+0.16% of GDP) and the estimated deficit revision due to capital expenditure (0.12% of GDP). Therefore the initial deficit quality issues were related to current and capital expenditure quality issues. Furthermore, the estimated deficit revisions due to current expenditure decreased by 0.11 percentage points in the second period and it thus explains most of the quality improvement in expenditure data.

Table 8

Deficit revisions due to expenditure

	2001-2006	2007-2012
Expenditure [~Deficit]	0.10% [0.29%]	0.25% [0.14%]
Current expenditure [~Deficit]	0.15% [0.16%]	0.14% [0.05%]
Social payments	0.08%	-0.14%
Interest payable	-0.05%	0.04%
Compensation of employees	0.08%	0.12%
Intermediate consumption	0.14%	0.08%
Other current expenditure	-0.10%	0.04%
Capital expenditure [~Deficit]	-0.04% [0.12%]	0.12% [0.09%]

Source: ECB calculations.
Note: Average aggregated total EA12 expenditure revisions. The numbers in brackets show the identified average deficit revisions related to expenditure revision, extrapolated such that the average expenditure revisions related to deficit revisions minus the average revenue revisions related to deficit revisions are equal to the average deficit revision. The (not extrapolated) identified average deficit revisions related to revenue or expenditure revision are shown in the annex in Table 4.2(1b) with an identification threshold of 70%.

4.3 Deficit vs. DDA and Δdebt revisions

Table 9 summarises the estimated deficit revision in the first and second period due to DDA and Δdebt revisions. More detailed tables and charts are included in Annex 4.3.

[15] The estimated deficit revision due to current [capital] expenditure revisions is calculated using the average aggregated EA12 current [capital] expenditure revision during all single, country revisions identified as related to deficit revision. It is then extrapolated by multiplying it with the same factor used for the extrapolated deficit revision due to expenditure revisions.

Table 9

Average deficit revisions due to DDA and Δdebt revisions

	2001-2006	2007-2012
Deficit	0.27%	0.11%
(-)DDA **[~Deficit]**	0.16% [0.22%]	0.10% [0.11%]
Δdebt **[~Deficit]**	0.11% [0.05%]	0.01% [0.00%]

Source: ECB calculations.
Note: Average aggregated, total EA12 deficit, DDA and Δdebt revisions. The numbers in brackets show the identified average deficit revisions related to DDA or Δdebt revision, extrapolated such that the average Δdebt revisions related to deficit revisions minus the average DDA revisions related to deficit revisions are equal to the average deficit revision. The (not extrapolated) identified average deficit revisions related to Δdebt or DDA revision are shown in the annex in 4.3(1b) with an identification threshold of 70%.

In the first period, 190 single, country deficit revisions were identified as related to DDA revisions, while only 35 single, country deficit revisions were identified as related to Δdebt revisions. Furthermore, 117 single, country deficit revisions corresponded to residual revisions and 162 single, country revisions remained unexplained. Therefore the DDA revisions explain the majority of the deficit upward revisions, whereas the impact of Δdebt revisions on the deficit is rather small. In particular, the estimated deficit revision due to DDA revisions is +0.22% of GDP in the first period. Therefore the deficit quality issue was mainly corresponding to a DDA quality issue.

In the second period, 155 single, country deficit revisions were identified as related to DDA revisions, 19 single, country deficit revisions were identified as related to Δdebt revisions, 108 single, country deficit revisions corresponded to residual revisions and 174 single, country revisions remained unexplained. The DDA revisions still explain most of the deficit upward revisions and the impact of Δdebt revisions on the cancels out. However, the estimated deficit revision due to DDA revisions decreased by 11 percentage points. Therefore, the deficit quality improvement was also related to an improvement in the quality of DDA data.

5 Bias through accrual accounting and statistical discrepancies

This section presents further evidence of quality improvement by analysing the correlations between the transmissions of the third pillar of the DDA analysis (known as “time of recording and other discrepancies” or TOR&OD), its own revisions and the deficit revisions. This part of the DDA analysis is very important in the GFS quality analysis because it can reveal optimist fiscal accounting or a possible attempt to beautify the initial deficit data.

Components such as the change in other accounts receivables or payables (for instance accrued taxes not yet received or military expenditures not yet paid) and statistical discrepancies (between financial and non-financial data) are put together within the third pillar of the DDA analysis. These data – which could be partly computed as residual variable - could contain a lot of errors in measurement (which is called “”noise” in econometrics) and uncertainties in the first transmissions, which may be revised over time. During the period, specific efforts have been undertaken over the years through the controlling procedures of the fiscal data by Eurostat together with other statistical authorities to identify and reduce the unexplained amounts of statistical discrepancies and of other accounts receivable (but not paid) within the government accounts.

Furthermore, an increasing divergence of the third pillar’s components from zero after successive years might signal a recording issue. This happens for instance when a government records year after year of increasing net amounts of fiscal payments to be received or of invoices to be paid, whereas the respective accrued revenue or expenditure are already booked in the fiscal balance. This is also the case when the statistical discrepancy between financial and non-financial data is biased by always supporting a deficit smaller than a change in debt.

The econometric tests indicate that the first single TOR&OD transmission contains information about the upcoming TOR&OD revisions (Section 5.1) and also about the upcoming deficit revisions (Section 5.2). However, the predictive power of the first transmission decreased in the second period, which indicates a higher quality of the TOR&OD data in the second period.

Similar to previous sections, the results presented in the coming tables are broken down into two periods: 2001-2006 and 2007-2012. For the sake of the reliability of the test, the regressions are calculated through three different specifications; (i) all variables denominated by the GDP of the respective countries of EA12 (ii) the same denominator as in (i) but Greek data are excluded and (iii) all variables denominated by the average GDP of EA12. The first specification (i) weights all countries equally while the specification (iii) gives a higher weight to large countries.

5.1 TOR&OD revisions vs. TOR&OD transmissions

Chart 6 shows the aggregated EA12 TOR&OD transmission t_1 compared to the transmission t_8. The first transmission is (in absolute value) usually higher than the final transmission. This indicates discrepancies in the first transmission which are revised and lowered in the successive revisions.

Chart 6

Euro area TOR&OD transmissions

Source: ECB calculations based on ESCB data.
Note: Aggregated EA12 Time of Recoding and other Discrepancies (TOR&OD) transmissions.

Table 10 and 11 summarises the results of the news or noise test suggested by Mankiw and Shapiro (1986)[16]. The first transmission TOR&OD t_1 is a good predictor of future TOR&OD revisions (a high first TOR&OD transmission is a good indicator of TOR&OD downward revisions) whereas the final transmission TOR&OD t_8 contains no information on the TOR&OD revisions. This suggests that the TOR&OD revisions are due to a noisy first transmission t_1. However, it is less surprising since the TOR&OD by definition contains the most uncertain and noisy data. The question is whether the TOR&OD revisions mirror unavoidable uncertainties or optimistic recording of fiscal balances and creative accounting.

[16] See closely under the item 10 of the References.

Table 10

Regression TOR&OD revision on TOR&OD transmission t_1

$TOR\&OD_{t_1-t_8} = b_0 + b_1\ TOR\&OD_{t_1}$		Specification 1	Specification 2	Specification 3
Countries		EA12	EA11 (w/o GR)	EA12
Number of observations		72	66	72
Denominator		Country GDP	Country GDP	average EA12 GDP
01-06	b_1	-0.74	-0.51	-0.60
	[P-Value]	0.00	0.00	0.00
	R^2	0.59	0.38	0.53
07-12	b_1	-0.51	-0.49	-0.16
	[P-Value]	0.00	0.00	0.01
	R^2	0.40	0.40	0.10

Source: ECB calculations.

Table 11

Regression TOR&OD revision on TOR&OD transmission t_8

$TOR\&OD_{t_1-t_8} = b_0 + b_1\ TOR\&OD_{t_8}$		Specification 1	Specification 2	Specification 3
Countries		EA12	EA11 (w/o GR)	EA12
Number of observations		72	66	72
Denominator		Country GDP	Country GDP	average EA12 GDP
01-06	b_1	0.43	0.26	0.15
	[P-Value]	0.01	0.04	0.28
	R^2	0.09	0.07	0.02
07-12	b_1	0.21	0.18	0.09
	[P-Value]	0.08	0.14	0.15
	R^2	0.04	0.03	0.03

Source: ECB calculations.

5.2 Deficit revision vs. TOR&OD transmissions

In the last section we showed that the TOR&OD transmissions are noisy and that the revisions are predictable. In this section we try to answer the question whether the TOR&OD revisions represent unavoidable uncertainties or creative accounting. In order to reject the hypothesis of creative accounting, one needs to show that the TOR&OD transmissions contain no information about the future deficit revisions.

Table 12 shows that TOR&OD t_1 was correlated with deficit upward revisions in the first period. Therefore, one cannot exclude that the TOR&OD was used for creative accounting in the first period. In the second period, the TOR&OD t_1 can explain less variation of the deficit revisions (the R^2 decreased in all specifications) and it became uncorrelated to the deficit revisions[17]. Accordingly, a high TOR&OD transmission t_1 no longer indicates deficit upward revisions. Therefore the TOR&OD was most likely not used for creative accounting in the second period.

[17] In the first specification the correlation decreased, in the second it has the wrong sign and in the third it is close to zero and not significant.

Table 12

Regression deficit revision on TOR&OD transmission t_1

$Deficit_{t_1-t_8} = b_0 + b_1\ TOR\&OD_{t_1}$		Specification 1	Specification 2	Specification 3
Countries		EA12	EA11 (w/o GR)	EA12
Number of observations		72	66	72
Denominator		Country GDP	Country GDP	average EA12 GDP
01-06	b_1	0.80	0.35	0.51
	[P-Value]	0.00	0.01	0.00
	R^2	0.36	0.11	0.38
07-12	b_1	0.23	0.01	-0.19
	[P-Value]	0.03	0.87	0.02
	R^2	0.06	0.00	0.08

Source: ECB calculations.

Table 13

Regression deficit revision on TOR&OD transmission t_8

$Deficit_{t_1-t_8} = b_0 + b_1\ TOR\&OD_{t_8}$		Specification 1	Specification 2	Specification 3
Countries		EA12	EA11 (w/o GR)	EA12
Number of observations		72	66	72
Denominator		Country GDP	Country GDP	average EA12 GDP
01-06	b_1	-0.03	-0.05	0.16
	[P-Value]	0.89	0.74	0.26
	R^2	0.00	0.00	0.02
07-12	b_1	-0.25	-0.09	-0.28
	[P-Value]	0.06	0.30	0.00
	R^2	0.05	0.02	0.16

Source: ECB calculations.

6 Impact of the "EDP control tools" on the deficit revisions

In the fiscal economic literature, the influence of the election cycle on the budget balance is often mentioned[18] or econometrically tested as well as sometimes the data revision related to it[19]. So far there is no trace in the literature of the quantitative impact on the deficit revision of two statistical tools set up since inception in the framework of the Excessive Deficit Procedure.

The first are the EDP reservations released by Eurostat through its press communiqué[20] on the official fiscal deficit and debt of the EU Member States according to the EDP protocol (also called Maastricht deficit and debt). The second are the EDP dialogue visits to the respective EU countries. The analysis presented below shows that these two statistical tools influence significantly the pattern of the deficit revisions. As such, one has to consider whether these variables could not be further used to estimate the fiscal deficit.

6.1 Impact of EDP reservations

When Eurostat expresses a reservation about the EDP data notified by a country, it typically signals that there are remaining pending issues related to the quality of EDP data. The issues may be related to incorrect or incomplete data sources and implementation of methodological standards and guidance. The reservations are expressed irrespectively of the size and magnitude of possible revisions. An econometric analysis may be set up to investigate the association between reservations and revisions.

The econometric results are presented in Table 14. Furthermore, a summary of all EDP reservations published by Eurostat in its EDP press releases since 2001 and additional robustness tests are included in Annex 6.1. Since the reservations are country-specific, the analysis focuses only on the country revisions denominated by their respective GDP (and not on the aggregated euro area). The data corresponding to "euro area" presented below are the average of the country revisions. The impact of a reservation is estimated by the single revisions (t_i to t_{i+1}), rather than by the total revision (t_1 to t_8). A reservation can influence one single, country revision (for example a reservation in the spring 2002 notification in a specific country may impact the single, country revision from 2002 t_1 to t_2). Let a "normal deficit revision" be a single, country deficit revision from t_i to t_{i+1} not influenced by a reservation and a

18 For instance, see the paper "Political Budget Cycles" of L. Aaskoven and D.D. Lassen released by Oxford Research Encyclopedia of Politics in April 2017 and its long list of references.

19 See in the References, the item 9 "Fiscal data revisions in Europe", the working paper No 1342 at the ECB.

20 See for instance the latest EDP press release of April 2017

"deficit revision after a reservation" be a single country deficit revision from t_i to t_{i+1} influenced by a reservation.

Table 14

The impact of EDP reservations from 2001 to 2012

				Average deficit revision t_i to t_{i+1} in notifications		
	Average deficit revision t_1 to t_8	Average deficit revision t_i to t_{i+1}	Number of deficit reservation	(i) without deficit reservation (β_0)	(ii) with deficit reservation ($\beta_0 + \beta_1$)	Are the deficit revisions significantly (α=15%) larger in notifications with reservation? [t-Value β_1)
BE	0.24%	0.03%	1	0.01%	2.34%	Yes [25.70]
DE	0.11%	0.02%	1	0.02%	0.00%	No [-0.13]
IE	0.06%	0.01%	1	0.00%	0.43%	Yes [2.49]
GR	2.38%	0.34%	9	0.31%	0.58%	Yes [1.15]
ES	0.24%	0.03%	0	-	-	-
FR	0.00%	0.00%	1	0.00%	-0.03%	No [-0.66]
IT	0.23%	0.03%	2	0.03%	0.24%	Yes [1.63]
LUX	-0.76%	-0.11%	0	-	-	-
NL	0.11%	0.02%	0	-	-	-
AT	0.42%	0.06%	1	0.06%	-0.09%	No [-0.49]
PT	0.48%	0.07%	4	0.06%	0.16%	Yes [1.24]
FI	-0.03%	0.00%	0	-	-	-
EA12	0.29%	0.04%	20	0.06%	0.39%	-

Source: ECB calculations
Note: All data are presented in percent of the country's GDP and the euro area data are presented as the average euro area revisions. The reservations on the deficit include both reservations with a focus on the deficit data only and the nine reservations related to deficit and debt data simultaneously. The reservations of debt data only are all reservations with a clear focus on the debt data.
Let $\Delta d_{t,i,c}$ be the deficit revision for year t between notification i and $i+1$ in country c and let Reservation $t_{i,c}$ be equal to one (i) if there is an EDP deficit reservation for country c in year t and notification i and (ii) zero otherwise. Let $\varepsilon_{t,i,c}$ be the residual. The average deficit revision with and without a deficit reservation is calculated by estimating $\Delta d_{t,i,c} = \beta_0 + \beta_1\ Reservation_{t,i,c} + \varepsilon_{t,i,c}$ for every euro area country. Each country has 80 observations.

In total, there were 20 reservations related to the deficit data. Eight of twelve countries had at least one deficit reservation during the 24 EDP notifications between 2001 and 2012. Only two reservations were debt specific and did not include any deficit issue.

The average single, country deficit revision between 2001 and 2012 was 0.04% of GDP. The average normal deficit revisions in countries which had at least one reservation during the whole period were 0.06% of GDP. This difference was influenced by Luxembourg which helped to lower the first average but not the second average.

The average deficit revision after a reservation was 0.39% of GDP, which is nine times higher than the average single, country deficit revision. However, a substantial share of this average revision during reservations is due to the reservation in Belgium which led to a sizeable deficit revision. Without the impact of Belgium, the average revision after a reservation is 0.11% of GDP, which is still almost two times higher than the average normal deficit revision. Based on alternative specifications to account for country and time effects, the size of the average EA12 revision during reservations remained between 0.27% and 0.42% of GDP, see Annex Table 6.1(1a).

In five of eight countries which had reservations, we observe that the deficit revision after the reservation was significantly (with the significance level α=15%) larger than the normal deficit revisions in the given country.

6.2 Impact of EDP dialogue visits

During the EDP dialogue visits, Eurostat reviews the EDP statistics data and methodological issues in a given country. These country visits usually take place every two years[21]. This section shows that the EDP Dialogue Visits had a measurable impact on the deficit revisions, i.e. the deficit revisions are on average higher in the notification following a mission. The revisions in Greece are excluded.

Table 15 shows the average deficit revision of all notifications[22] directly after a mission, two releases after a mission and not succeeding a mission. The revisions are denominated by the country's GDP. The average of all single revisions in notifications after a mission is more than four times higher than the average of all single revisions in notifications not succeeding a mission.

Table 15

The impact of EDP dialogue visits from 2001 to 2012

Average deficit revision	2002-2016
(i) in notifications	0.016% of GDP *(0.111% of GDP)**
(ii) in the first notification after a mission	0.027% of GDP *(0.191% of GDP)**
(iii) in the second notification after a mission	0.013% of GDP *(0.088% of GDP)**
(iv) in notifications not succeeding a mission	0.006% of GDP *(0.043% of GDP)**

Source: ECB calculations.
Note: The data above show the EA11 (EA12 excluding Greece) average revisions in a notification. Each revision is denominated by the respective countries' GDP. In each country, the revision in a notification is the average of all single deficit revisions in the given notification (for example average deficit revision in the autumn 2007 notification is equal to the average of the deficit revisions 2006_t_1-t_2, 2005_t_3-t_4, 2004_t_5-t_6 and 2003_t_7-t_8). * Average deficit revision in transmissions projected to the complete revision from t_1 to t_8, by multiplying the average deficit revision in transmissions times seven.

The difference between the average deficit revision of all notifications directly succeeding a mission (the average deficit revision of all notifications two releases after a mission) and the average deficit revisions of all notifications not succeeding a mission is a simple estimator for the immediate (lagged) influence of an EDP dialogue visit. The immediate and lagged influence is shown in Table 16. The estimated immediate influence of an EDP dialogue visit is 0.021% of GDP and the estimated lagged influence is 0.007% of GDP.

21 In a few cases, the official EDP dialogue visits are complemented by ad hoc specific bilateral visits between Eurostat and the National Statistical Authorities (usually to fix specific issues). The impact of these ad hoc visits is not measured in the following econometric calculations.

22 A spring notification contains three single revisions and an autumn notification contains four single revisions. The deficit revision in a notification is defined as the average of all single deficit revisions in the notification and the average deficit revision of all notifications is the average over all notifications.

Table 16

The impact of EDP dialogue visits from 2001 to 2012

Impact of EDP missions on the deficit revisions	2002-2016
Immediate influence	0.021% of GDP (0.148% of GDP)
Lagged influence	0.007% of GDP (0.049% of GDP)

Source: ECB calculations.
Note: The immediate influence is equal to Table 9a (ii)- Table 9a (iv) and the lagged influence is equal to Table 9a (iii)- Table 9a (iv).
* Influence projected to the complete revision from t1 to t8, by multiplying the immediate or lagged influence by seven.

Additional tests confirming the robustness of the results are presented in Annex 6.2 (we controlled for country and years effects).

7 Link between deficit revisions and deficit level

This last section analyses the correlation between the deficit revisions and its first or final transmissions. The final deficit transmission t_8 turns out to have explanatory power for the deficit revisions in small countries in the first period. Its explanatory power decreased in the second period. We will argue that this is a further sign of quality improvement because the deficit revisions based on unbiased data might be not correlated to the size of the deficit.

We assume that the true deficit is given by its final transmission t_8. The first transmission t_1 is an estimator of the true deficit and then the revision t_1-t_8 is equal to the estimation error. The initial transmission t_1 should be an unbiased estimator of the true value. Consequently, the probability of underestimating the deficit should be independent from the size of its true value. In other words, a higher true deficit should not increase the likelihood of underestimating the deficit in the first transmission. As a consequence, the final deficit transmission should be uncorrelated to the deficit revision t_1-t_8.[23] Additionally, analogous to the news or noise analysis, the first deficit transmission t_1 should also contain no information on the deficit revision t_1-t_8.

Tables 17 and 18 show the news or noise regressions and Table 19 adds the first TOR&OD transmission t_1 as an additional control variable. In all specifications the first deficit transmission t_1 contains no information about the future deficit revisions.

Table 17

Regression deficit revision on deficit transmission t_1

$deficit_{t_1-t_8} = b_0 + b_1\, deficit_{t_1}$		Specification 1a	Specification 2a	Specification 3a
Countries		EA12	EA11 (w/o GR)	EA12
Number of observations		72	66	72
Denominator		Country GDP	Country GDP	average EA12 GDP
01-06	b_1	0.08	0.04	0.01
	[P-Value]	0.21	0.33	0.59
	R^2	0.02	0.01	0.00
07-12	b_1	0.01	0.00	0.00
	[P-Value]	0.76	0.91	0.80
	R^2	0.00	0.00	0.00

Source: ECB calculations.

However, in some specifications the final deficit transmission t_8 contains information about the previous deficit revisions. Table 18 and 19 shows that the deficit t_8 has explanatory power in the specifications 1b, 1c, 2b and 2c and hence in small

[23] Following the *news or noise* analysis, a correlation between the final transmission deficit t_8 and the deficit revision t_1-t_8 would indicate revisions due to news and it would be a sign of high quality. Therefore, our interpretation stands in contrast to the common *news or noise* analysis.

countries[24]. Therefore, small countries with a high final deficit tended to underestimate the deficit in their first transmission. The deficit t_8 is only slightly significant in specification 3b), but not significant in specification 3c). Since these specifications attach greater weight to countries with a high GDP, we conclude that the correlation between high deficits and high deficit revisions was more common in small countries. Castro, Pérez and M. Rodriguez-Vives (2011) do find the same correlations for the first period. They concluded that, due to the common news or noise analysis, this indicates a higher quality in small countries. On the contrary, we argue that countries which have a high deficit should not be more likely to underestimate their deficit in the first transmissions than countries with a small deficit. Based on this viewpoint, we conclude that the quality in the first period was higher in large countries and lower in small countries.

Table 18

Regression deficit revision on deficit transmission t_8

$deficit_{t_1-t_8} = b_0 + b_1\, deficit_{t_8}$		Specification 1b	Specification 2b	Specification 3b
Countries		EA12	EA11 (w/o GR)	EA12
Number of observations		72	66	72
Denominator		Country GDP	Country GDP	average EA12 GDP
01-06	b_1	0.23	0.11	0.04
	[P-Value]	0.00	0.00	0.04
	R^2	0.30	0.16	0.06
07-12	b_1	0.03	0.01	0.01
	[P-Value]	0.09	0.52	0.29
	R^2	0.04	0.01	0.02

Source: ECB calculations.

Table 19

Regression deficit revision on deficit transmission t_8

$deficit_{t_1-t_8} = b_0 + b_1\, TOR_{t_1} + b_2\, deficit_{t_8}$		Specification 1b	Specification 2b	Specification 3b
Countries		EA12	EA11 (w/o GR)	EA12
Number of observations		72	66	72
Denominator		Country GDP	Country GDP	average EA12 GDP
01-06	b_1	0.23	0.11	0.04
	[P-Value]	0.00	0.00	0.04
	R^2	0.30	0.16	0.06
07-12	b_1	0.03	0.01	0.01
	[P-Value]	0.09	0.52	0.29
	R^2	0.04	0.01	0.02

Source: ECB calculations.

In the second period (2007-2012), the explanatory power of the deficit transmission t_8 decreased in all specifications. There is no longer a visible bias of (small or large) countries with high deficits to underestimate their deficit in the first transmission.

[24] The deficit t_8 is a good predictor in the specifications 1b), 2b), 1c) and 2c), which weight all countries equally. However, it is not a good predictor in specifications 3b) and 3c), which attach greater weight to countries with a higher GDP. Therefore, the deficit t_8 is only a good predictor in small countries.

8 Outlook

The study focuses on the result of the econometric tests to assess the quality of Government Finance Statistics (GFS) and Excessive Deficit Procedure (EDP) data since the introduction of the euro and mainly on the key question of whether there was a systematic bias to beautify (or not) the deficit as notified initially by the Member States.

The institutional and legislative aspects as well as the important work achieved by the statistical authorities to improve the fiscal data were intentionally not considered here. These aspects should be covered in a separate document outside the scope of the quantitative study document.

Indeed, the qualitative progress over the years of the fiscal data in the euro area which is supported by this analysis was not taken as granted a priori. It needed first to be econometrically established and further documented. Second, as the analysis is based on 8 successive vintages of annual fiscal data released twice a year through the EDP notification, its current scope cannot go beyond 2012.

It would be worth analysing further the period from 2013 to 2016 – considering among other things the new regulation on fines and penalties in force since 2012. Based on this technique of 7 successive revisions for each specific annual data, the examination of the qualitative progress of fiscal data up to 2016 will be possible in 2020. Moreover, the analysis could be extended to include complementary tests on the main fiscal ratio (deficit or surplus and debt) such as the influence of electoral cycles on the GFS data revisions. It could also be broadened in scope by investigating the systematic bias of the fiscal estimates or forecasts.

Finally, the analysis is based on the accounting identity in fiscal data that the deficit is equal to the change in Maastricht debt minus the “stock-flow adjustment” (also known as the deficit-debt adjustment). This accounting identity based on various data sets compiled independently is the core of specific tools to assess the quality of data in fiscal matter. This topic will be further explained in a separate ECB paper to be entitled: “*Deficit-debt analysis, an analytical tool to assess the quality of government finance statistics*.”

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Evolution over time of the main literature about the quality of GFS data based on a DDA analysis

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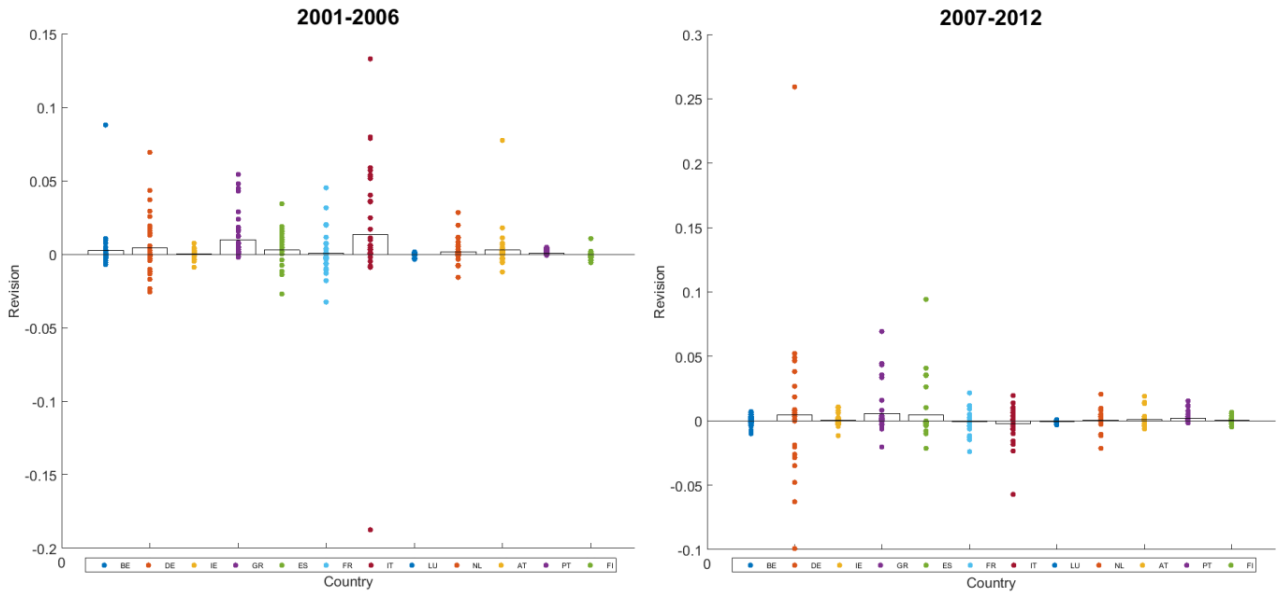
Annexes

The numbering of annexes (charts and tables) corresponds to the respective chapters in the core document.

Annex 3.1

Chart 3.1(4a)

Single deficit revisions in euro area countries

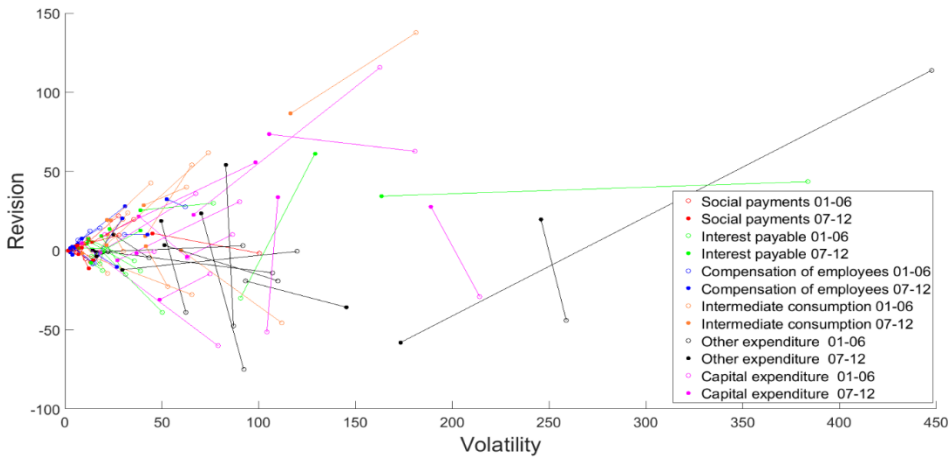


Source: ESCB data base related to EDP data.
Note: Single deficit revision in percentage of the countries' GDP. The bar chart shows the average single deficit revision in a given country.

Annex 3.2

Chart 3.2(2a)

All EA12 countries expenditure: relative revision vs. relative volatility of revisions



Source: ECB calculations based on ESCB database.
Note: Revisions from t_1 to t_8 in percent of the variable's first transmission in all EA12 countries. The volatility equals the absolute revision from t_1 to t_8 in percent of the variable's first transmission. The aggregated EA12 data are shown in Section 3.2.

Annex 4.2

Table 4.2(2a)

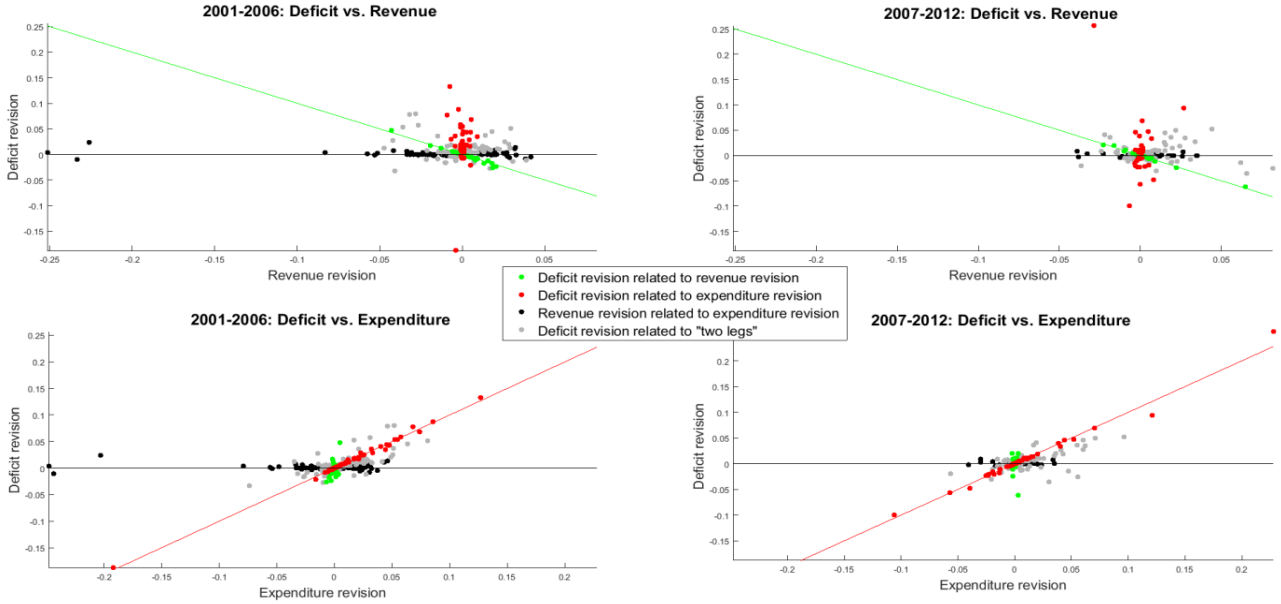
Deficit revisions due to revenue

	2001-2006	2007-2012
Revenue [~Deficit]	-0.17% [-0.01%]	0.14% [-0.03%]
Current revenue [~Deficit]	-0.14% [-0.02%]	0.13% [-0.04%]
Direct taxes	0.01%	0.01%
Indirect taxes	-0.14%	-0.28%
Net social contributions	0.03%	-0.01%
Other current revenues	-0.04%	0.25%
Capital revenue [~Deficit]	-0.03% [0.00%]	0.01% [0.01%]

Source: ECB calculations.
Note: Average aggregated, total EA12 revenue revisions. The numbers in brackets show the identified average deficit revisions related to revenue revision, extrapolated such that the average expenditure revisions related to deficit revisions minus the average revenue revisions related to deficit revisions are equal to the average deficit revision. The (not extrapolated) identified average deficit revisions related to revenue or expenditure revision are shown in the annex in Table 4.2(1b) with an identification threshold of 70%.

Chart 4.2(1a)

Identification of single deficit revisions (expenditure and revenue)



Source: ECB calculations.
Note: Single deficit revisions in percentage of EA12 GDP. The identification process is described in Section 4.1 and the identification threshold is 70%.

Table 4.2(1b)

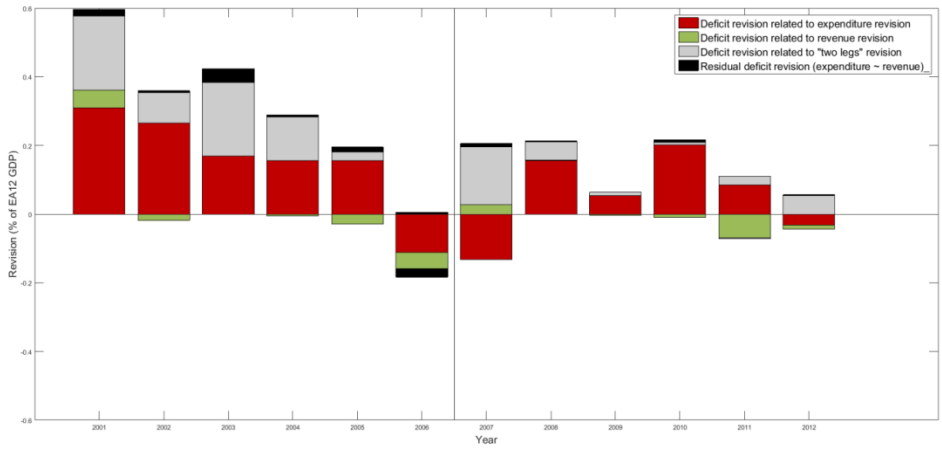
Deficit revisions due to expenditure and revenue revisions

	2001-2006			2001-2006		
Deficit revision (observations)	0.27% (504)			0.27% (456)		
Revenue revision (observations)	-0.17% (504)			-0.17% (456)		
Expenditure revision (observations)	0.10% (504)			0.10% (456)		
Threshold	**80%**	**70%**	**60%**	**80%**	**70%**	**60%**
(i) Revenue revision: Revenue - Deficit (matched points)	0.00% (34)	**-0.01% (48)**	-0.01% (55)	-0.01% (42)	**-0.01% (55)**	-0.01% (62)
(ii) Expenditure revision: Expenditure - Deficit (matched points)	0.14% (83)	**0.16% (96)**	0.20% (112)	0.04% (70)	**0.06% (86)**	0.06% (101)
(iii) Residual deficit revision Revenue - Expenditure (matched points)	0.01% (102)	**0.02% (125)**	0.03% (149)	0.00% (49)	**0.00% (66)**	-0.00% (90)
(iv) Unexplained deficit revision (matched points)	0.12% (285)	**0.11% (235)**	0.06% (188)	0.07% (295)	**0.06% (249)**	0.06% (203)

Source: ECB calculations.
Note: The matched points show the number of single revisions identified in the groups (i)-(iv) (shown in Chart 4.2(1a) for the threshold 70%). The revisions in (i)-(iv) are the respective aggregates of the matched points. The extrapolated revisions shown in Chart 4.2(1) use the revisions shown in this table, but extrapolated such that (ii)-(i) is equal to the deficit revision. For the threshold 70% the revisions (i) and (ii) are extrapolated by 1.59.

Chart 4.2(1c)

Deficit revisions due to expenditure and revenue revisions

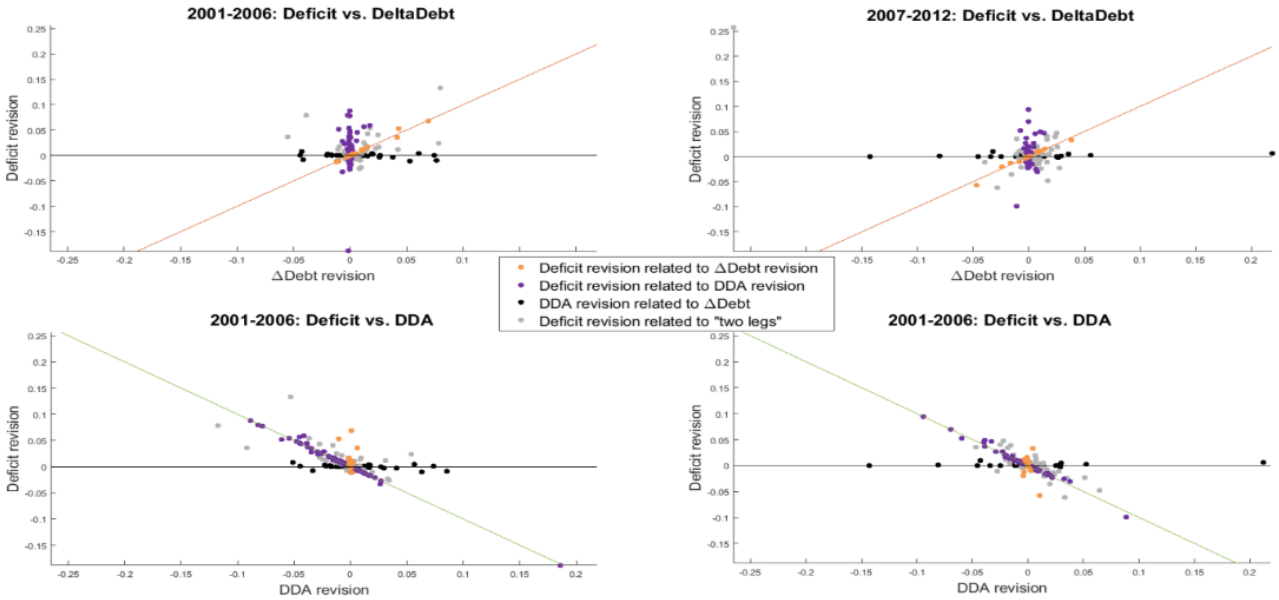


Source: ECB calculations.
Note: Aggregated, total EA12 deficit revision due to expenditure, revenue, unknown ("two legs") and residual revisions. The identification process is described in Section 4.1 and the identification threshold is 70%. The underlying identified single revisions are shown in Table 4.2(1a). The number of identified single revisions and the (not extrapolated) average aggregated revisions due to expenditure, revenue, unknown ("two legs") and residual revisions are shown in Table 4.2(1b).

Annex 4.3

Chart 4.3(1a)

Identification of single deficit revisions (DDA and ΔDebt)



Source: ECB calculations.
Note: Single deficit revisions in percentage of EA12 GDP. The identification process is described in Section 4.1 and the identification threshold is 70%.

Table 4.3(1b)

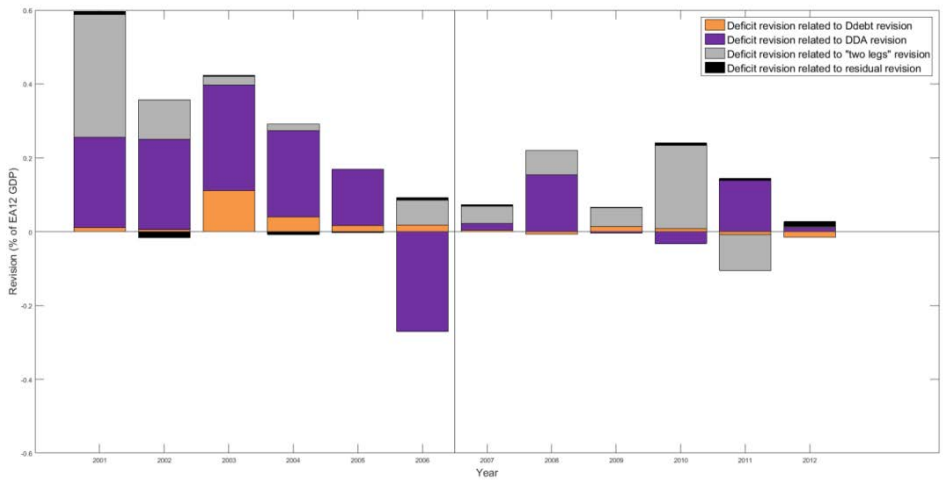
Deficit revisions due to DDA and ∆debt revisions

		2001-2006			2001-2006		
Deficit revision (observations)		0.27% (504)			0.10% (456)		
DDA revision (observations)		-0.16% (504)			-0.09% (456)		
∆debt revision (observations)		0.11% (504)			0.01% (456)		
Threshold		**80%**	**70%**	**60%**	**80%**	**70%**	**60%**
(i)	**DDA revision: DDA - Deficit** (matched points)	0.12% (174)	**0.15% (190)**	0.16% (208)	0.04% (130)	**0.05% (155)**	0.04% (172)
(ii)	**∆debt revision: ∆debt - Deficit** (matched points)	0.03% (27)	**0.03% (35)**	0.04% (44)	0.01% (10)	**-0.00% (19)**	0.01% (26)
(iii)	**Residual deficit revision DDA - ∆debt** (matched points)	-0.00% (109)	**-0.00% (117)**	0.01% (130)	0.00% (94)	**0.01% (108)**	0.00% (131)
(iv)	**Unexplained deficit revision** (matched points)	0.12% (194)	**0.09% (162)**	0.06% (122)	0.06% (222)	**0.09% (174)**	0.04% (131)

Source: ECB calculations.
Note: The matched points show the number of single revisions identified in the groups (i)-(iv) (shown in Chart 4.3(1a) for the threshold 70%). The revisions in (i)-(iv) are the respective aggregates of the matched points. The extrapolated revisions shown in Chart 4.3(1) use the revisions shown in this table, but extrapolated such that (ii)+(i) is equal to the deficit revision. For the threshold 70% the revisions (i) and (ii) are extrapolated by 1.5.

Chart 4.3(1c)

Deficit revisions due to DDA and ∆Debt revisions



Source: ECB calculations.
Note: Aggregated EA12 deficit revision due to DDA, □debt, unknown ("two legs") and residual revisions. The identification process is described in Section 4.1 and the identification threshold is 70%. The underlying identified single revisions are shown in Table 4.3(1a). The number of identified single revisions and the (not extrapolated) average aggregated revisions due to expenditure, revenue, unknown ("two legs") and residual revisions are shown in Table 4.3(1b).

Annex 6.1

Table 6.1(1a)

Robustness tests: the impact of EDP reservations

Model 1	0.33	
	OLS	**FGLS**
Model 2	0.43 [0.06]	0.40 [0.03]
Model 3	0.30 [0.06]	0.30 [0.01]
Model 4	0.28 [0.06]	0.28 [0.01]

Source: ECB calculations.
Note: Model 1: Table 14: (ii)-(i).
Model 2: $\Delta deficit_{_i,t,j} = b_0 + b_1\ Reservation_{_i,t,j} + e_{_i,t,j}$.
Model 3: $\Delta deficit_{_i,t,j} = b_0 + b_1\ Reservation_{_i,t,j} + b_2\ Country\text{-}Dummy_{_i} + e_{_i,t,}$.
Model 4: $\Delta deficit_{_i,t,j} = b_0 + b_1\ Reservation_{_i,t,j} + b_2\ Country\text{-}Dummy_{_i} + b_3\ Year\text{-}Dummy_{_t} + e_{_i,t,j}$.
Model 2-4: Impact is equal to b_1.
$\Delta deficit_{_i,t,j}$ is the jth deficit revision in country i for data in year t, in percent of the country's GDP. $Reservation_{_i,t,j}$ is equal to one if there was a reservation for the data in country i, year t and transmission j. Number of observations 2002-2012: 960.

Table 6.1(1.3)

EDP reservations

			2001 - 1	2001 - 2	2002 - 1	2002 - 2	2003 - 1	2003 - 2	2004 - 1	2004 - 2	2005 - 1	2005 - 2	2006 - 1	2006 - 2	2007 - 1	2007 - 2	2008 - 1	2008 - 2	2009 - 1	2009 - 2	2010 - 1	2010 - 2	2011 - 1	2011 - 2	2012 - 1	Sum of Reservations	2012 - 2	2013 - 1	2013 - 2	2014 - 1	2014 - 2	2015 - 1	Sum of Reservation
EA19	EA12	Belgium	BE																								1							2
		Germany	DE																								1							1
		Ireland	IE																								1							1
		Greece	GR																								10							10
		Spain	ES																								0							0
		France	FR																								1							2
		Italy	IT																								3							3
		Luxembourg	LUX																								0							0
		Netherlands	NL																								0							1
		Austria	AT																								1							3
		Portugal	PT																								4							5
		Finland	FI																								0							0
		Sum of Reservation		3	2	2	0	1	0	3	4	2	0	0	0	1	0	0	1	1	1	0	0	1	0	0	22	1	1	0	1	1	1	28
		Estonia	EE																								0							0
		Cyprus	CY																								0							0
		Latvia	LV																								2							2
		Lithuania	LT																								1							1
		Malta	MT																								0							0
		Slovenia	SL																								0							0
		Slovakia	SK																								0							0
		Sum of Reservation		3	2	2	0	2	0	5	4	2	0	0	0	1	0	0	1	1	1	0	0	1	0	0	25	1	1	0	1	1	1	31

data not available | deficit&debt reservation | deficit reservation | debt reservation

Source: ECB reading of the EDP press releases by Eurostat.

Note: A reservation in the table in year t and country c indicates that there was an EDP reservation for the data in country c and year t. This corresponds to an EDP reservation in the EDP notification published in year $t+1$. For example a reservation published in the spring 2016 notification usually refers to the first vintage of the 2015 data, since the spring 2016 notification contains the first data for the year 2015. The above table shows this reservation in the first vintage of the 2015 data.

Annex 6.2

Table 6.1(2aa)

Details: the impact of EDP dialogue visits from 2001 to 2012

Average deficit revision	2002-2016	2006-2016
(i) in notifications	0.016% of GDP *(0.111% of GDP)**	0.010% of GDP *(0.068% of GDP)**
(ii) in the first notification after a mission	0.027% of GDP *(0.191% of GDP)**	0.015% of GDP *(0.102% of GDP)**
(iii) in the second notification after a mission	0.013% of GDP *(0.088% of GDP)**	0.013% of GDP *(0.092% of GDP)**
(iv) in notifications not succeeding a mission	0.006% of GDP *(0.043% of GDP)**	0.000% of GDP *(-0.003% of GDP)**

Source: ECB calculations.
Note: The data above show the EA11 (EA12 excluding Greece) average revisions in a notification. Each revision is denominated by the respective countries' GDP. In each country, the revision in a notification is the average of all single deficit revisions in the given notification (for example average deficit revision in the autumn 2007 notification is equal to the average of the deficit revisions 2006_t_1-t_2, 2005_t_3-t_4, 2004_t_5-t_6 and 2003_t_7-t_8). * Average deficit revision in transmissions projected to the complete revision from t_1 to t_8, by multiplying the average deficit revision in transmissions times seven.

Table 6.1(2ab)

Details: the impact of EDP dialogue visits from 2001 to 2012

Impact of EDP missions on the deficit revisions		2002-2016	2006-2016
Model 1	Immediate influence	0.021% of GDP (0.148% of GDP)*	0.015% of GDP (0.105% of GDP)*
	Lagged influence	0.007% of GDP (0.049% of GDP)*	0.014% of GDP (0.095% of GDP)*
Model 2	Immediate influence	0.032% of GDP (pValue=0.05) (0.028% of GDP)*	0.024% of GDP (pValue=0.21) (0.171% of GDP)*
	Lagged influence	0.025% of GDP (pValue=0.14) (0.173% of GDP)*	0.024% of GDP (pValue=0.21) (0.171% of GDP)*
Model 3	Immediate influence	0.032% of GDP (pValue=0.06) (0.223% of GDP)*	0.025% of GDP (pValue=0.21) (0.171% of GDP)*
	Lagged influence	0.024% of GDP (pValue=0.15) (0.167% of GDP)*	0.025% of GDP (pValue=0.020) (0.177% of GDP)*
Model 4	Immediate influence	0.024% of GDP (pValue=0.14) (0.170% of GDP)*	0.024% of GDP (pValue=0.21) (0.164% of GDP)*
	Lagged influence	0.012% of GDP (pValue=0.46) (0.087% of GDP)*	0.019% of GDP (pValue=0.32) (0.134% of GDP)*

Source: ECB calculations.
Note: Model 1: Immediate influence = (ii)-(iv); Lagged influence = (iii)-(iv).
Model 2: $\Delta deficit_{_i,t,j} = b_0 + b_1\ Mission1_{_i,t,j} + b_2\ Mission2_{_i,t,j} + e_{_i,t,j}$.
Model 3: $\Delta deficit_{_i,t,j} = b_0 + b_1\ Mission1_{_i,t,j} + b_2\ Mission2_{_i,t,j} + b_3\ Year\text{-}Dummy + e_{_i,t,j}$.
Model 4: $\Delta deficit_{_i,t,j} = b_0 + b_1\ Mission1_{_i,t,j} + b_2\ Mission2_{_i,t,j} + b_3\ Year\text{-}Dummy + b_4 Country\text{-}Dummy + e_{_i,t,j}$.
Model 2-4: Immediate influence = b_1; Lagged influence = b_2.
$\Delta deficit_{_i,t,j}$ is the j's deficit revision in country i for data in year t, in percent of the country's GDP. $Mission1_{_i,t,j}$ is equal to one if there was a mission immediately before i,t,j. $Mission2_{_i,t,j}$ is equal to one if there was a mission one revision before i,t,j. Number of observations 2002-2016 [2006-2016]: 935 (EA12\Greece) [759 (EA12\Greece)]. * Influence projected to the complete revision from t_1 to t_8, by multiplying the immediate or lagged influence by seven.

Abbreviations

CMFB	Committee on Monetary, Finance and Balance of Payments Systems
DDA	deficit-debt adjustment
Δdebt	change in debt (between time t and time $t-1$)
EA	euro area
ECB	European Central Bank
EDP	Excessive Deficit Procedure
ESA	European system of accounts
ESS	European Statistical System
ESCB	European System of Central Banks
GDP	gross domestic product
GFS	Government Finance Statistics
MoF	Ministry of Finance
NCB	National Central Bank
NSI	National Statistical Institute
TMFA	transactions in main financial assets
TOR	time of recording
VE&OCV	valuation effect and other change in volume

Acknowledgements

The authors would like to thank all colleagues from the European System of Central Banks (ESCB) who commented the draft document or facilitated the econometric study. A special thanks to the team of the Government Finance Statistics (GFS) unit at the ECB and especially Linda Kezbere and Patrick Grussenmeyer for their support to the database. To Caroline Willeke and Julia Catz for the review of the document, as well as to the members of the ESCB Working Group on GFS for their useful comments. Thanks also to Marta Rodriguez (DG-E/FIP) as well as to Luca Ascoli and Denis Besnard (Eurostat) for their valuable comments. Finally the work has benefited from the feedback and suggestions by the Editorial Board of the Statistics Paper Series (ECB).

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ISSN	2314-9248 (pdf)	DOI	10.2866/30406 (pdf)
ISBN	978-92-899-2840-3 (pdf)	EU catalogue No	QB-BF-17-008-EN-N (pdf)