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Revision Analysis of Italian Quarterly National Accounts

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Sommario

Questo lavoro analizza il processo di revisione delle stime del Pil e dei principali aggregati dei Conti Economici Trimestrali attraverso alcuni indicatori sintetici e un'analisi 'news-noise' volta a identificare se le cause della revisione siano riconducibili ad un errore di misura oppure all'acquisizione di nuove informazioni. Le serie analizzate sono calcolate in variazioni percentuali rispetto al trimestre precedente, espresse in volume e valutate al netto degli effetti della stagionalità e dei giorni lavorativi, per i periodi a partire dal 1999.Q1 fino al 2013.IVQ. Nel lavoro si dimostra che gli indicatori statistici delle revisioni sono soggetti a cambiamenti legati al periodo temporale osservato. L'analisi evidenzia comportamenti diversi delle revisioni a seconda che si consideri l'intero campione oppure i singoli trimestri omogeni. Per l'intero campione la media delle revisioni non risulta quasi mai significativa, mentre la significatività compare nell'analisi condotta con finestre mobili che mettono in luce la presenza di distorsioni, con particolare riferimento ai dati relativi agli Investimenti, alle Esportazioni e ai Consumi della Pa. L'evidenza econometrica segnala la prevalenza delle news nella spiegazione delle revisioni per gli aggregati dei Consumi delle famiglie e degli Investimenti. Per il Pil anche la noise gioca un ruolo ma l'impatto è sistematicamente inferiore all'effetto news. La stessa evidenza vale anche per i Consumi della Pa.

Parole chiave: Revisione dei dati, Pil trimestrale e sue componenti, Dati in '*real time*'.

Abstract

The present paper focuses on measuring the revision process of quarterly national account estimates released by Istat (Italian National Institute of Statistics) over the 15 years between 1999 Q1 and 2013 Q4. More in detail, quarter on quarter changes of real GDP and its main components are analysed, measured in chained values (or at constant prices for old vintages) and net of calendar and seasonal effects. The study highlights that the performance of statistical indicators usually adopted to perform revision analyses proves dependent on the time span specifically considered. Indeed the findings concerning both the last 15 years as a whole and the single quarters show uneven behaviour in the different quarters within the considered year. The evidence based on developments over the full period shows that average revisions are in general negligible; on the contrary, they turn statistically significant based on moving window analysis, resulting in some bias in the revisions between E2 and E1 concerning Gross fixed capital formation, Exports and Public consumption. Finally, standard 'news or noise' analysis is performed in order to assess the ability of preliminary estimates of GDP and its main components to efficiently forecast the respective final estimate.

Keywords: Data revisions, quarterly GDP and its components, real time data

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Indice

1. Introduction

Statistical information on economic developments in the short run plays an increasing role not only for economic analysis and forecasts, but also for policy making aimed at sustaining growth and the conditions for financial and macroeconomic stability. At the same time, the production of statistics has achieved important progress towards enhancing the quality and international comparability of key variables, often implying substantial innovations in standards and data sources, as in the case of the recent introduction of ESA2010 in the compilation of national accounts across European countries. Moreover, the increasing data demand comes hand in hand with a more urgent need for a timely detection of the cyclical economic conditions.

In this framework, the revision analysis represents a key diagnostic tool in order to test and improve the quality of data. It allows to monitor the evolution and to assess the origins of revisions based on a set of statistical indicators that summarize the main features of the revision process since the initial up to the final estimates.

The revision analysis provides a valuable contribution in order to meet the demand for transparency of the data production since it allows to disclose in real time pieces of information helpful for a proper reading of estimates released at each step in the revision process. In this respect, the revision analysis plays a key role on both the producer and user side to better understand the possible impact coming from new information that become available over time, after the first estimates of economic data for a reference period have been released. Indeed the ultimate scope of the revision analysis is to detect and to provide valuable hints to solve the potential trade-off between quality and timeliness of the statistical data.

On the user side, the analysis helps to assess the reliability of the preliminary compared to later estimates and to understand the possible sources of uncertainty surrounding the latest release. On the producer side, the analysis highlights potential factors regularly leading to data revisions and the possible solutions for improving the revision policy. On both sides, the revision analysis is particularly useful to monitor the impact of the innovations in data sources, methodology and accounting standards.

In general the revision process of the quarterly national accounts (QNA) may last over time due to both the ongoing inflows of new information (ordinary revisions) and structural innovations in source data, concepts and methods adopted (extraordinary revisions). The indirect approach followed in the current methodology to derive quarterly from the annual data implies that the choice of short term indicators play a key role to affect the quality of QNA.

However, the availability of complete information regarding short term indicators does not rule out that a vintage of quarterly data may be later revised following the revisions in annual data. The latter may be due both to the exploitation of possibly new and more robust source data, and to the update balancing between estimates on the demand and the supply side.

Additional factors that may cause revisions in quarterly data relate to the regular maintenance of methods for working day and seasonal adjustment.

Both the size and the direction of revisions in quarterly national accounts may be affected by the features of the business cycle fluctuations, too. In particular, during stages of strong economic changes revisions could become larger and more uncertain if the compilation systems of the quarterly national accounts is better suited to keep up with a steady path of growth, and may fail to detect in real time sudden changes in the business cycle conditions. Possible reasons for this kind of effects could be loss in representativeness of the short term indicators adopted in the quarterly estimation process as well as to some compilation technics used, such as fixed ratio assumptions or extrapolation based on recent observations, whose soundness may fail against structural breaks and non-linearities possibly arising during the crisis.

2. Data set and methodology

This paper examines the revision pattern of the quarterly data of the Italian GDP and its main components regarding the first estimates of seasonally and working day adjusted quarter on quarter rate of growth of chained volume measures (or constant prices) as published in successive quarters. The time span runs over 15 years, from 1999 Q1 to 2013 Q4.

Revisions are analyzed at different stages of the production process, through different standard indicators for both the full time horizon and for two subsamples, namely the periods before and after the inception of the Great Recession in Italy, dated at2008Q1. The scope is to test for the Italian economy the evidence received from the literature that the size and direction of revisions may be affected by the position over the business cycle (Croushore 2011; Sinclair and Stekler 2001; Marini and Shrestha 2013).

Indicators are also computed over five years moving windows in order to shed light on the possible changes over time in the estimation process and the ensuing impact on revisions. Accordingly, the statistical significance of mean revisions is tested depending on the choice of the time horizon.

Finally, the standard 'news or noise' analysis is performed in order to assess the ability of the preliminary estimates of GDP and its main components to efficiently forecast of the respective final estimate. Mankiw and Shapiro (1986) investigate revisions under two different perspectives regarding their possible origins. In the first, revisions are assumed to be caused by measurement errors made in the early estimates, for example due to biased or small sample (hypothesis "noise"). Accordingly, the subsequent estimates tend to be negatively correlated with the early estimates (e.g. an exceptionally high preliminary estimate of GDP would be revised downward), and the latter could be improved t by taking account such correlation. In the second perspective, revisions arise because early estimates contain a forecast error of the subsequently updated estimates. Accordingly, if errors are not systematic, the two vintages of estimates tend to be uncorrelated (hypothesis "news"), and revisions cannot be foreseen based on early estimates as the forecast accuracy is not univocally determined.

The data are extracted from a real-time data base, called a revision triangle. The latter is a useful device to collect all data vintages that have been released over time regarding the time series of a single macro aggregate. The choice of the initial vintage is conditioned on both the availability of historical data and the occurrence of deep innovations in accounting standards and methodology. The revisions refer to the percentage variations (either quarter on previous quarter or year on previous year) observed at time t and it is defined as follows:

$$R_t = L_t - E_t$$

where L_t and E_t are the Later and the Earlier estimates, respectively.

The paper adopts the following notations for the different estimates produced regarding a given quarter: i) **P** identifies the first estimate of GDP quarterly growth that is published around 45 days after the end of the reference period as the GDP preliminary estimate is first released based on about 60% of the total dataset on the (supply side and almost 40% on the demand side; ii) **E1** stands for the first estimates of Quarterly National Accounts published around 70 days after the end of the reference period based on a reasonably large coverage of the dataset (about 90% of the total)[2]; iii) **E2** refers to estimates published a quarter later based on almost a total coverage; iv) **Y1** identifies estimates published one year later (after 4 quarters), that are available as the first estimate of new annual data are released; v) **Y2** are estimates published two year later (after 8 quarters) as the second estimates of annual data are produced; vi) **Y3** stands for estimate published three year later (after 12 quarters) in connection with the final estimates of the annual data.

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[2] According to the regulations regarding the adoption of new ESA2010, the first release of QNA is due 60 days after the end of the reference period.

3. Key findings

The key findings regarding indicators of the revisions in quarterly changes of GDP and its main components, on both the demand and the supply side, concern the full sample (from 1999 Q1 to 2013 Q4) and are the following.

GDP and most components (**table 1a**) show virtually nihil Mean Revisions (**MR**) along the different steps to the final estimates, implying a very limited bias in the preliminary figures; persistence in revisions proves significant for gross fixed capital formation, that is underestimated in the first (E1) against the second (E2) estimate and even more so with respect to the figure released three year later (Y3); exports are significantly overestimated only in E1 against E2.

Although systematic bias proves in general negligible, evidence for single quarters is occasionally less reassuring; for example, imports are underestimated in the first and in the fourth quarter, with an offsetting positive bias in the second and in the third when E1 is compared with Y3 figures.

Regarding the size of revisions, usually measured through the Absolute Mean Revision (**MAR**), there is a positive trend between E1 and Y3 estimates for almost all components, while the size of revision remains limited for GDP; similar evidence comes also from the analysis of the Relative Absolute Mean Revision (**RMAR**), which is more suitable for comparing components as it takes into account the different scales of revisions.

The variance of revisions, measured by the standard deviations (**DSR**), is small for GDP and most components, although gradually increasing along the steps of the revision process. Variance is larger, in particular after three years, for exports and imports, (2,2 e 2,1 respectively), as their source data are usually subject to major revisions due to news that in general come out together with the update estimates of the annual national accounts.

The impact of revisions on the growth rates of different variables, which is detected by the sign concordance between each pair of estimates, is very modest in the first step of the revision process; for wider horizons we find a declining frequence of sign concordance, in particular for consumption by general government and non- profit household serving institution and gross fixed capital formation. However sign concordance remain high, implying a sound coherence of the first estimates to changes over time of a single variable.

Also regarding the main components on the supply side (**Table 2**) in the whole sample It comes out a virtually nihil mean revision for value added in all sectors with the exception of construction, where first estimates (E1) prove significantly lower than the second (E2). However, looking at the single quarters, construction sector results show a systematically positive and negative bias respectively in E1 compared to E2 and to Y3 in the second quarter; in the retail activity estimates in E1 are marginally lower than in E2 for the first three quarters while in the industry the MR proves significantly negative for E2-E1 in the third quarter. For all sectors, the RMA shows increasing values between the first and the last estimates.

Focusing on GDP revisions in the two subsamples before and after the financial crisis (**table 1b**) MR turns negative for periods since 2008Q1 from the positive values characterizing previous quarters, thus confirming the tenant that during recessions first estimates reveal a positive bias. Our evidence holds true for all steps along the revision process. Moreover, the patterns of the MAR and DSR show that both the size and volatility of revisions is higher after the crisis.

By taking five years moving windows to check the sensitivity of results to the choice of the reference period, as for GDP the RMAR computed for E2-E1 remains virtually unchanged around 0,1% for all windows. For main components of supply and demand the same statistics show a convergence over time, more pronounced after the window 2004.Q2-2009.Q1, and stabilize around 0.2% (**Figure 1**).

Following the same approach as in Mankiw and Shapiro revisions are tested if they are driven by measurement errors ("noise") or new information gathered over time ("news"). Our econometric evidence points to a prominent role of the latter for the estimates of Household Consumption and Gross Fixed Capital Formation for all steps of the revision process. For GDP both noise and news prove important, although the impact of new information is systematically stronger; the same result holds true also for Government Consumption as far as revisions Y1-E1 and Y3-E1

are concerned **(Table 3)**.

Conclusions

The revision analysis plays a key role on both the producer and user side to better understand the magnitude and the origins of the uncertainty surrounding key economic data in the period between their first and the final releases. However the performance of statistical indicators usually adopted to perform the revision analysis proves dependent on the time span specifically considered. Indeed our findings concerning both the last 15 years as a whole and the single quarters show uneven behaviour inside the year in the different quarter. The evidence based on developments over the full period shows that the average revisions are in general negligible; on the contrary, they turn statistically significant based on moving window analysis, that find some bias in the revisions between E2 and E1 concerning Gross fixed capital formation, Exports and Public consumption.

The pattern of revisions prove asymmetric across the different conditions of the business cycle. In particular, our findings for periods since the start of the Great Recession show that the early estimates tend to overstate the dynamics compared to the later releases, while no regularities is found for the periods before. Moreover, volatility and magnitude have increased since the crisis and greater in size compared with periods prior to the crisis. According to econometric evidence, the occurance of fresh information since the first release largely explains revisions regarding Household spending and Gross fixed capital formation. As for data on GDP, "noise" also plays a role, but the impact is regularly lower compared to the effects of "news"; similar evidence holds for most revisions in Public consumption.

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Table 1a - Statistics on Revisions to GDP q/q-1 growth rates and its components

GDP and Components	Direction of the revision (MR)				Persistence in revisions — Statistical significance of the mean revision				Size of the revisions — MAR (% points)				RMAR				Variance of revisions — DSR				Impact of revisions on the growth rate — sign concordance between previou and last estimate (% of observation)			
	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1
All sample																								
GDP	0.00	-0.01	-0.01	0.01	NO	NO	NO	NO	0.05	0.05	0.12	0.20	0.11	0.11	0.26	0.41	0.07	0.08	0.16	0.26	98	95	92.6	95.7
Imports of Goods and Services	0.21	-0.16	-0.04	-0.17	NO	NO	NO	NO	0.87	0.62	1.14	1.67	0.39	0.30	0.54	0.75	1.45	0.95	1.54	2.11	86	93	85.2	82.6
Final Domestic Consumption	0.01	-0.02	-0.05	-0.02	NO	NO	NO	NO	0.20	0.11	0.26	0.30	0.49	0.27	0.63	0.79	0.30	0.14	0.32	0.39	90	91	81.5	78.3
Government Consumption	-0.02	0.02	-0.04	0.13	NO	NO	NO	NO	0.24	0.16	0.37	0.39	0.83	0.53	1.13	1.24	0.36	0.24	0.52	0.49	73	89	74.1	71.7
Gross Fixed Capital Formation	0.04	0.12	0.16	0.24	NO	SI**	NO	SI*	0.42	0.33	0.59	0.82	0.32	0.23	0.41	0.57	0.59	0.46	0.76	1.07	96	91	79.6	78.3
Exports og Goods and service	-0.03	-0.25	-0.02	-0.17	NO	SI*	NO	NO	0.62	0.66	1.25	1.72	0.23	0.26	0.49	0.60	0.89	0.95	1.70	2.22	92	89	92.6	89.1
First quarter																								
GDP	-0.01	0.01	-0.02	0.00	NO	NO	NO	NO	0.07	0.04	0.12	0.23	0.12	0.07	0.19	0.37	0.09	0.05	0.14	0.34	100	100	92.9	100.0
Imports of Goods and Services	0.59	-0.39	-0.57	1.03	NO	SI*	NO	SI**	0.77	0.70	1.47	1.29	0.28	0.31	0.64	0.56	1.67	1.09	1.89	1.27	100	87	78.6	75.0
Final Domestic Consumption	0.12	-0.01	-0.09	0.00	NO	NO	NO	NO	0.22	0.09	0.24	0.21	0.40	0.19	0.48	0.43	0.33	0.13	0.34	0.29	92	93	85.7	91.7
Government Consumption	0.07	-0.07	-0.25	0.10	NO	NO	NO	NO	0.29	0.18	0.55	0.55	1.27	0.49	1.43	1.47	0.43	0.26	0.78	0.72	62	100	71.4	66.7
Gross Fixed Capital Formation	0.31	0.19	0.18	0.56	NO	SI**	NO	NO	0.50	0.28	0.61	1.12	0.29	0.15	0.33	0.61	0.76	0.34	0.74	1.48	100	93	92.9	83.3
Exports og Goods and service	0.01	-0.62	-0.80	0.77	NO	SI**	NO	NO	0.70	0.76	1.51	1.65	0.24	0.26	0.50	0.49	1.10	0.93	1.82	1.92	92	87	85.7	91.7
Second quarter																								
GDP	0.02	-0.01	0.05	0.03	NO	NO	NO	NO	0.05	0.05	0.11	0.14	0.14	0.15	0.30	0.42	0.07	0.07	0.15	0.18	92	93	100.0	100.0
Imports of Goods and Services	0.32	-0.26	-0.16	-1.58	NO	NO	NO	SI**	1.01	0.74	1.05	2.16	0.56	0.40	0.53	1.03	1.63	0.82	1.37	2.19	69	87	85.7	83.3
Final Domestic Consumption	-0.05	-0.06	0.00	-0.12	NO	SI**	NO	NO	0.17	0.10	0.30	0.38	0.59	0.26	0.80	1.13	0.21	0.11	0.36	0.47	92	87	64.3	58.3
Government Consumption	0.05	-0.02	-0.19	-0.04	NO	NO	SI*	NO	0.14	0.10	0.37	0.36	0.53	0.28	1.03	0.91	0.19	0.14	0.38	0.49	92	87	64.3	83.3
Gross Fixed Capital Formation	-0.12	0.02	0.25	-0.30	NO	NO	NO	SI*	0.31	0.24	0.62	0.54	0.30	0.22	0.54	0.48	0.36	0.31	0.65	0.61	85	93	71.4	91.7
Exports og Goods and service	-0.16	-0.27	-0.04	-1.26	NO	NO	NO	SI*	0.89	0.71	1.03	1.96	0.37	0.33	0.46	0.79	1.15	0.80	1.46	2.13	92	93	100.0	83.3
Third quarter																								
GDP	0.01	-0.03	-0.10	-0.09	NO	NO	SI**	NO	0.04	0.06	0.13	0.18	0.11	0.15	0.34	0.41	0.05	0.07	0.13	0.22	100	100	92.9	91.7
Imports of Goods and Services	-0.04	0.11	-0.46	-1.36	NO	NO	SI*	SI***	0.60	0.66	0.71	1.66	0.24	0.35	0.37	0.81	0.84	1.25	0.88	1.49	100	100	92.9	83.3
Final Domestic Consumption	0.03	-0.01	-0.05	-0.01	NO	NO	NO	NO	0.16	0.14	0.22	0.29	0.53	0.40	0.62	0.91	0.22	0.17	0.28	0.37	100	93	92.9	83.3
Government Consumption	-0.14	0.07	0.14	0.22	NO	NO	NO	SI*	0.22	0.22	0.21	0.30	0.67	0.93	0.82	1.35	0.28	0.28	0.26	0.29	77	79	85.7	75.0
Gross Fixed Capital Formation	0.13	-0.02	-0.20	0.06	NO	NO	NO	NO	0.35	0.29	0.44	0.63	0.35	0.28	0.39	0.57	0.41	0.31	0.58	0.80	100	93	78.6	66.7
Exports og Goods and service	0.00	0.06	0.03	-1.37	NO	NO	NO	SI**	0.56	0.73	1.10	1.56	0.18	0.24	0.36	0.46	0.74	1.29	1.59	1.82	100	93	92.9	100.0
Fourth quarter																								
GDP	-0.02	0.01	0.03	0.11	NO	NO	NO	NO	0.06	0.06	0.13	0.25	0.09	0.11	0.24	0.46	0.07	0.11	0.18	0.28	100	85	83.3	90.0
Imports of Goods and Services	-0.05	-0.05	1.21	1.49	NO	NO	SI**	SI***	1.14	0.33	1.36	1.56	0.61	0.15	0.62	0.63	1.59	0.42	1.33	1.48	75	100	92.9	90.0
Final Domestic Consumption	-0.05	-0.01	-0.07	0.07	NO	NO	NO	NO	0.26	0.11	0.27	0.31	0.50	0.29	0.67	0.86	0.41	0.15	0.33	0.42	75	92	83.3	80.0
Government Consumption	-0.06	0.11	0.17	0.26	NO	NO	NO	SI**	0.32	0.15	0.34	0.35	0.94	0.55	1.14	1.32	0.46	0.24	0.39	0.31	58	92	75.0	60.0
Gross Fixed Capital Formation	-0.16	0.33	0.47	0.74	NO	NO	NO	SI*	0.51	0.51	0.74	1.03	0.35	0.29	0.42	0.59	0.64	0.68	0.98	0.99	100	85	75.0	70.0
Exports og Goods and service	0.02	-0.15	0.87	1.43	NO	NO	NO	SI*	0.32	0.38	1.38	1.68	0.14	0.19	0.76	0.80	0.47	0.58	1.68	1.74	83	85	91.7	80.0

Source: Istat

Table 1B - Statistics on Revisions to GDP q/q-1 growth rates and its components

GDP and Components	Direction of the revision — MR				Persistence in revisions — Statistical significance of the mean revision				Size of the revisions — MAR (% points)				RMAR				Variance of revisions — DSR				Impact of revisions on the growth rate — sign concordance between previous and last estimate (% of observations)			
	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1
pre-crisis 1999.01-2008.1																								
GDP	0.02	0.00	0.00	0.02	NO	NO	NO	NO	0.04	0.05	0.10	0.15	0.11	0.11	0.25	0.38	0.06	0.06	0.13	0.20	97	91	91.4	94.3
Imports of Goods and Services	0.35	-0.15	0.07	-0.23	NO	NO	NO	NO	1.18	0.73	1.32	1.61	0.56	0.40	0.72	0.85	1.81	1.14	1.74	2.08	79	97	82.9	80.0
Final Domestic Consumption	0.10	-0.02	-0.03	-0.04	NO	NO	NO	NO	0.26	0.12	0.25	0.27	0.61	0.31	0.63	0.70	0.37	0.15	0.32	0.35	86	89	82.9	82.9
Government Consumption	-0.04	0.05	0.07	0.17	NO	NO	NO	SI*	0.26	0.20	0.37	0.44	1.03	0.66	1.19	1.42	0.39	0.28	0.45	0.53	68	86	74.3	71.4
Gross Fixed Capital Formation	0.22	0.07	0.14	0.27	SI*	NO	NO	SI*	0.47	0.31	0.67	0.86	0.43	0.25	0.53	0.68	0.66	0.45	0.82	1.10	100	94	77.1	77.1
Exports og Goods and service	-0.04	-0.31	0.00	-0.31	NO	SI*	SI*	NO	0.79	0.78	1.52	1.74	0.25	0.29	0.57	0.66	1.05	1.09	1.98	2.29	96	89	91.4	85.7
post 2008.2-2013.04																								
GDP	-0.02	-0.02	-0.03	-0.03	NO	NO	NO	NO	0.07	0.06	0.17	0.34	0.12	0.11	0.26	0.47	0.08	0.10	0.20	0.42	100	100	94.7	100.0
Imports of Goods and Services	0.04	-0.17	-0.25	-0.01	NO	NO	NO	NO	0.51	0.44	0.82	1.86	0.21	0.18	0.32	0.57	0.85	0.54	1.09	2.31	96	86	89.5	90.9
Final Domestic Consumption	-0.09	-0.03	-0.10	0.04	SI***	NO	NO	NO	0.12	0.10	0.29	0.38	0.31	0.23	0.63	1.13	0.13	0.12	0.33	0.49	96	95	78.9	63.6
Government Consumption	0.00	-0.03	-0.24	0.00	NO	NO	SI*	NO	0.21	0.09	0.35	0.24	0.64	0.30	1.04	0.72	0.34	0.12	0.60	0.29	78	95	73.7	72.7
Gross Fixed Capital Formation	-0.17	0.20	0.20	0.15	SI*	SI**	NO	NO	0.35	0.35	0.47	0.70	0.22	0.20	0.26	0.35	0.41	0.47	0.65	1.01	91	86	84.2	81.8
Exports og Goods and service	-0.03	-0.16	-0.05	0.27	NO	NO	NO	NO	0.42	0.45	0.75	1.63	0.20	0.20	0.32	0.45	0.67	0.68	1.06	1.99	87	91	94.7	100.0

Source: Istat

	sample	n° of observations						
		all sample	I_Q	II_Q	III_Q	IV_Q	pre-crisis 1991-2008-1	post-crisis 2008_2-2013_4
E1-P	2000_3 / 2013_4	51	13	13	13	12	29	22
E2-E1	1999_1 / 2013_4	58	15	15	14	14	35	23
Y1-E1	1999_1 / 2013_1	56	15	15	14	12	35	21
Y3-E1	1999_1 / 2011_1	48	13	13	12	10	35	13

Table 2 Statistics on Revisions to Expenditure Components q/q-1 growth rates

Expenditure components	Direction of the revisions — MR			Persistence in revisions — Statistical significance of the mean revision			Size of the revisions — MAR (% points)			Size of the revisions — RMAR			Variance of revisions — DSR			Impact of revisions on the growth rate — sign concordance between earlier and later estimate (% of observations)		
	E2-E1	Y1-E1	Y3-E1	E2-E1	Y1-E1	Y3-E1	E2-E1	Y1-E1	Y3-E1	E2-E1	Y1-E1	Y3-E1	E2-E1	Y1-E1	Y3-E1	E2-E1	Y1-E1	Y3-E1
All sample																		
Agriculture Forestry and Fishing	0.00	0.01	-0.15	NO	NO	NO	0.69	1.74	2.12	0.32	0.82	1.02	1.13	2.43	3.05	89	77.8	82.6
Industry excluding construction	0.01	0.06	0.06	NO	NO	NO	0.21	0.54	0.59	0.20	0.49	0.55	0.33	0.69	0.80	84	72.2	71.7
Construction	0.13	0.04	-0.04	SI**	NO	NO	0.33	0.59	0.92	0.37	0.68	1.09	0.46	0.80	1.14	93	87.0	65.2
Wholesale, retail, hotels, trans, comm.	-0.06	-0.02	0.00	NO	NO	NO	0.23	0.45	0.53	0.39	0.76	0.85	0.30	0.56	0.70	86	72.2	69.6
Financial, real estate, renting, busin. Activ.	0.02	-0.07	0.02	NO	NO	NO	0.27	0.50	0.54	0.53	0.94	0.91	0.37	0.62	0.78	74	64.8	78.3
Other service activities	0.00	0.01	0.03	NO	NO	NO	0.13	0.29	0.33	0.45	0.99	1.11	0.18	0.38	0.42	91	75.9	73.9
Total service	-0.01	-0.03	0.01	NO	NO	NO	0.10	0.22	0.30	0.26	0.57	0.71	0.13	0.27	0.39	93	83.3	82.6
pre-crisis 1999.01-2008.1																		
Agriculture Forestry and Fishing	0.09	-0.04	-0.19	NO	NO	NO	0.90	1.90	2.39	0.45	0.96	1.19	1.38	2.54	3.41	83	80.0	80.0
Industry excluding construction	-0.01	0.06	0.03	NO	NO	NO	0.19	0.45	0.50	0.28	0.72	0.75	0.25	0.57	0.59	83	62.9	68.6
Construction	0.20	0.19	0.09	SI**	NO	NO	0.39	0.66	0.99	0.51	0.89	1.31	0.52	0.88	1.23	89	80.0	60.0
Wholesale, retail, hotels, trans, comm.	-0.06	-0.02	0.00	NO	NO	NO	0.23	0.45	0.53	0.39	0.76	0.85	0.30	0.56	0.70	86	72.2	69.6
Financial, real estate, renting, busin. Activ.	0.03	-0.09	0.10	NO	NO	NO	0.33	0.55	0.55	0.51	0.88	0.84	0.43	0.69	0.80	74	68.6	82.9
Other service activities	0.01	0.08	0.06	NO	NO	NO	0.16	0.30	0.32	0.48	0.90	1.01	0.20	0.40	0.43	89	82.9	85.7
Total service	-0.01	-0.01	0.05	NO	NO	NO	0.11	0.21	0.26	0.25	0.51	0.58	0.14	0.26	0.34	97	85.7	85.7
post-crisis 2008.02-2013.04																		
Agriculture Forestry and Fishing	-0.13	0.11	0.00	NO	NO	NO	0.34	1.43	1.27	0.14	0.60	0.56	0.54	2.27	1.49	100	73.7	90.9
Industry excluding construction	0.02	0.06	0.16	NO	NO	NO	0.25	0.71	0.90	0.14	0.36	0.37	0.43	0.89	1.28	86	89.5	81.8
Construction	0.02	-0.24	-0.44	NO	SI*	SI**	0.24	0.46	0.67	0.21	0.42	0.61	0.35	0.55	0.63	100	100.0	81.8
Wholesale, retail, hotels, trans, comm.	-0.06	-0.08	0.01	NO	NO	NO	0.24	0.46	0.68	0.39	0.74	0.95	0.30	0.60	0.97	91	78.9	81.8
Financial, real estate, renting, busin. Activ.	0.02	-0.05	-0.24	NO	NO	NO	0.18	0.40	0.52	0.60	1.15	1.30	0.24	0.49	0.69	73	57.9	63.6
Other service activities	-0.02	-0.11	-0.06	NO	SI*	NO	0.09	0.27	0.35	0.40	1.23	1.55	0.13	0.33	0.39	95	63.2	36.4
Total service	-0.02	-0.08	-0.11	NO	NO	NO	0.09	0.23	0.43	0.30	0.75	1.23	0.11	0.28	0.53	86	78.9	72.7

Source: Istat

Figure 1 Relative means of absolute revisions RMAR moving windows 20 quarters GNP and Components
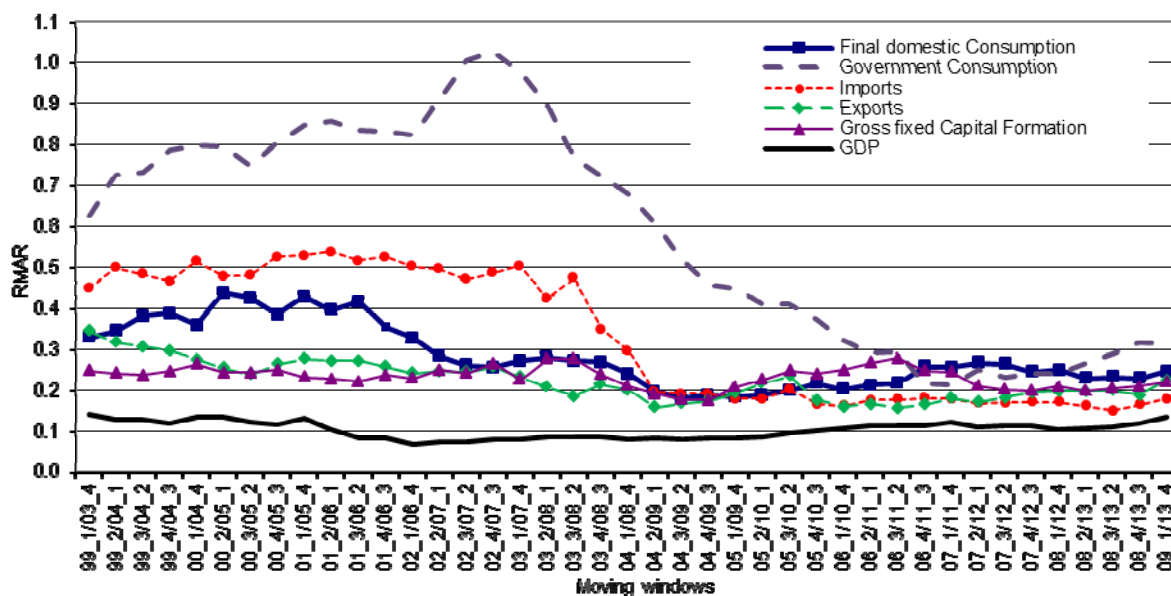
moving windows	GDP	Imports of Goods and Services	Final Domestic Consumption	Government Consumption	Gross Fixed Capital Formation	Exports of Goods and Services
			Statistical significance of the mean revision E2-E1			
99_1/03_4	NO	NO	NO	NO	NO	NO
99_2/04_1	NO	NO	NO	NO	NO	NO
99_3/04_2	NO	NO	NO	NO	NO	NO
99_4/04_3	NO	NO	NO	NO	NO	NO
00_1/04_4	NO	NO	NO	NO	NO	NO
00_2/05_1	NO	NO	NO	SI*	NO	NO
00_3/05_2	NO	NO	NO	SI*	NO	NO
00_4/05_3	NO	NO	NO	SI*	NO	NO
01_1/05_4	NO	NO	NO	SI*	NO	NO
01_2/06_1	NO	NO	NO	SI**	NO	NO
01_3/06_2	NO	NO	NO	SI*	NO	NO
01_4/06_3	NO	NO	NO	SI*	NO	SI*
02_1/06_4	NO	NO	NO	SI*	NO	SI*
02_2/07_1	NO	NO	NO	SI*	NO	SI*
02_3/07_2	NO	NO	NO	NO	NO	SI**
02_4/07_3	NO	NO	NO	SI*	NO	SI**
03_1/07_4	NO	NO	NO	NO	NO	SI*
03_2/08_1	NO	NO	NO	NO	NO	SI*
03_3/08_2	NO	NO	NO	NO	NO	NO
03_4/08_3	NO	NO	NO	NO	NO	SI*
04_1/08_4	NO	NO	NO	NO	NO	SI*
04_2/09_1	NO	SI**	NO	NO	NO	SI**
04_3/09_2	NO	SI*	NO	NO	NO	NO
04_4/09_3	NO	NO	NO	NO	NO	NO
05_1/09_4	NO	NO	NO	NO	NO	NO
05_2/10_1	NO	NO	NO	NO	SI*	SI*
05_3/10_2	NO	NO	NO	NO	SI*	SI*
05_4/10_3	NO	NO	NO	NO	SI**	NO
06_1/10_4	NO	NO	NO	NO	SI**	SI*
06_2/11_1	NO	SI*	NO	NO	SI**	SI*
06_3/11_2	NO	NO	NO	NO	SI**	NO
06_4/11_3	NO	NO	NO	NO	SI*	NO
07_1/11_4	NO	NO	NO	NO	NO	NO
07_2/12_1	NO	NO	NO	NO	SI*	NO
07_3/12_2	NO	NO	NO	NO	SI*	NO
07_4/12_3	NO	NO	NO	NO	SI**	NO
08_1/12_4	NO	NO	NO	NO	SI*	NO
08_2/13_1	NO	NO	NO	NO	SI*	NO
08_3/13_2	NO	NO	NO	NO	SI**	NO
08_4/13_3	NO	NO	NO	NO	SI*	NO
09_1/13_4	NO	NO	NO	NO	NO	NO

Table 3 - Results of 'news' 'noise' regression with Quarterly dummies

Value added components	Sample without extraordinary revisions				All sample			
	Q/Q-1 growth rate				Q/Q-1 growth rate			
	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1
Agriculture Forestry and Fishing				News +			News +	News +
Industry excluding construction		News +	News +			News +	News +	News +
Construction	Noise -	News +	News +	News +	Noise -	News +	News +	News +
Wholesale, retail, hotels, trans, comm.	News +		News +	News +	News +		News +	News +
Financial, real estate, renting, busin. Activ.	News +	News +	-+	News +	News +	News +	-+	-+
Other service activities	-+	News +	-+		-+	News +	-+	-+

GDP and its components	Sample without extraordinary revisions				All sample			
	Q/Q-1 growth rate				Q/Q-1 growth rate			
	E1-P	E2-E1	Y1-E1	Y3-E1	E1-P	E2-E1	Y1-E1	Y3-E1
GDP	+	+	+	News +	+	+	News +	News +
Imports of Goods and Services	Noise -		News +	Noise -	Noise -		+	Noise -
Final Domestic Consumption	Noise -	News +	News +	News +	Noise -	News +	News+	News +
Government Consumption	-+	-+	-+	-+	-+	-+	-+	-+
Gross Fixed Capital Formation	News +	News +	News +	News +	News +		News+	
Exports og Goods and service		News +	News +	News +			Noise -	Noise -

Ambiguous result: no hypothesis is rejected as both exogenous variables prove statistically significant

Noise hypothesis is not rejected, and critical signs are almost always negative

News hypothesis is not rejected, and critical signs are almost always positive

Both hypothesis are rejected

Source: Istat