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A Statistical Analysis of Revisions of Swedish National Accounts Data

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National Institute of Economic Research

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Abstract

In this paper, we study revisions of Swedish national accounts data. Three aspects of the revisions are considered: volatility, unbiasedness and forecast efficiency. Our results indicate that the properties of the revisions are more problematic for the production side than for the expenditure side. The high volatility of the revisions on the production side indicates that it, based on the initial data release, generally is difficult to make clear cut statements concerning production in different industries within the business sector; it is also likely to make forecasting more difficult. Concerning unbiasedness, there appears to be shortcomings for a number of variables, including GDP; this finding implies that it could be possible to improve the production of the Swedish national accounts data.

JEL classification code: E01

Keywords: Real-time data; Volatility; Unbiasedness; Forecast efficiency

Sammanfattning

I denna arbetsrapport analyseras historiska revideringar av svenska nationalräkenskapsdata utifrån tre aspekter: volatilitet, väntevärdesriktighet och prognoseffektivitet. Resultaten visar på problematiska aspekter av revideringarnas egenskaper – mer för produktionssidan än för BNP och användningssidan.

Den höga volatiliteten på produktionssidan gör det svårt att dra några slutsatser för de mindre delbranscherna utifrån preliminära kvartalsutfall. Det begränsar även möjligheterna att göra bra detaljerade branschprognoser, något som användare av data och prognoser på branscher bör vara uppmärksamma på. Hög volatilitet är olycklig, men bedöms huvudsakligen bero på att inledande publiceringar baseras på ofullständiga underlag. Att komma tillrätta med det problemet, exempelvis genom utökad statistikinsamling, bedöms emellertid vara svårt och behöver inte nödvändigtvis öka samhällsnyttan.

Det förefaller finnas brister avseende väntevärdesriktighet för ett antal variabler, bland annat BNP. Brister i väntevärdesriktighet och prognoseffektivitet indikerar att det kan finnas möjligheter att förbättra statistikproduktionen. Då systematiska över- eller underskattningar försämrar förutsättningarna för en hög prognosprecision vore det önskvärt att orsakerna till den bristande väntevärdesriktigheten undersöks så att eventuella brister kan åtgärdas.

1 Introduction

National accounts data are repeatedly revised for a number of reasons. Swedish national accounts data are normally first published approximately 60 days after the end of the quarter and are then to a large extent based on information from limited samples.[1] Revisions then take place sequentially when new quarterly data are published. The information underlying the quarterly calculations is less detailed than that used for the annual calculations which are published 21 months after the end of the year.[2] The quarterly national accounts data are therefore also revised when the annual calculations are published. Apart from the quarterly revisions and the revisions made at the annual calculations, there are also general oversights approximately every five years due to new methods, new data sources and a general adaptation to requirements and recommendations from the European Union. These oversights also generate revisions, often far back in time.[3]

That national accounts data are revised is accordingly a natural thing and it should mean that the data, as they are repeatedly revised, more closely reflect the actual state (or development) of the economy at a certain point in time. The fact that the initial data release not necessarily provides a correct picture means that the work of forecasters and economic decision makers is made more difficult though. Data revisions also complicate evaluations of economic policy, since the revised data might indicate a very different view about the economy than what the decision makers actually faced at the time of the decision; see, for example, Orphanides (2001) and Orphanides and van Norden (2002), Clausen and Meier (2005) and Cimadomo (2012).

In this paper, we analyse historical revisions of Swedish national accounts data. The purpose of the analysis is to assess whether the data are revised in a way that could be problematic to the users of the data. Earlier studies of revisions of Swedish national accounts – such as Öller och Hansson (2004), Statistics Sweden (2010, 2011) and Österholm (2011) – have focused on GDP and the expenditure side, for example, exports and household consumption. An important contribution of this paper is that the historical revisions of both the expenditure and production side are thoroughly analysed using methods which are commonly used for this purpuse.[4] Three aspects of the revisions are studied: *i)* volatility, *ii)* unbiasedness and *iii)* forecast efficiency. The reason for this focus is that it can give us information about whether the revisions are characterised by three properties which often are put forward as good properties for revisions to have; see, for example, Aruoba (2008).

The first of these properties is that the volatility should be low. If the volatility is low, this means that later data vintages will look approximately like the first vintage; ana-

[1] The first release of the second quarter is approximately 30 days after the end of the quarter.

[2] Before 2012, the annual calculations were published 23 months after the end of the year.

[3] In this paper, we make no distinction between the reasons for the revisions. It should be noted though that even if, for example, revisions due to changes in definitions at the general oversights are problematic for the users of the national accounts data, they are largely inevitable since the data must be adjusted to a changing world and new methods. Potential shortcomings in the revisions due to these oversights are accordingly difficult to address.

[4] The focus on the expenditure side is not only a feature of the studies that use Swedish data. It is uncommon in general to analyse the production side. See, for example, Rinne (1969) for an early study with a wide focus though.

lysts, forecasters and others using the data can then be reasonably confident that the picture of the Swedish economy initially painted by Statistics Sweden not will change dramatically over time. If the volatility instead is high, it means that it will be more difficult to make forecasts and statements concerning the economy since the data initially published tend to more poorly reflect the underlying state (or development) of the economy.

The second property is that the expected value of the revisions should be zero. If this is not the case, it means that the producer of the data – in this case Statistics Sweden – makes systematic errors. Such bias is of course not desirable since it indicates that the initially published data could be improved. Finding that there is a bias is also of interest to forecasters and analysts who typically would want to take such information into account. For example, it should be possible to make a better prediction of what a particular observation will be according to later vintages.

The third property is that the revisions should be uncorrelated with information that was available at the time of the first data release. In a similar way to bias, correlation with information that was available at the time of the first release implies both that it should be possible to improve the initially published data so that it more closely resembles later data vintages and that there is information that forecasters and analysts should be able to exploit for various purposes.

Concerning the terminology used in this paper – but also generally in related literature – it can be noted that it typically is the properties of the revisions that are discussed. This is a bit ambiguous. It seems reasonable to describe a "good" revision as one which makes the data give a more accurate description of the economy. It is possible to consider a situation where each revision leads to this but that properties of the revisions nevertheless are found to be flawed. The problem in this case is that the initial release has shortcomings and could be improved. This aspect of terminology should be kept in mind when the results are discussed.

Our results indicate that the properties of the revisions are more problematic for the production side than for the expenditure side. The volatility of the revisions for GDP and the majority of the analysed variables on the expenditure side is relatively low; it is primarily the volatility to the revisions of the export of services and general government consumption that appear problematic. On the production side, the volatility is large for many aggregates, the business sector as a whole and non-profit institutions serving households excepted.[5] This indicates that it, based on the initial data release, generally is difficult to make clear cut statements concerning production in different industries within the business sector. Concerning unbiasedness, there appears to be a systematic underestimation of the growth numbers for GDP, household consumption, exports and imports on the expenditure side. On the production side there seems to be a systematic underestimation of growth numbers for the business sector as a whole, the manufacturing industry and the service sector as a whole. The first release of the production in construction and in mining is, on the other hand, associated with systematic overestimation.

[5] In this paper, "production" refers to value added.

The rest of this paper is organised as follows. Section 2 gives a brief description of the data being analysed. In Section 3, we present the statistical methods employed. Section 4 describes the results and, finally, Section 5 concludes. In the appendix, all results are presented in tables.

2 Data

Real-time data on a quarterly frequency are analysed for variables (in fixed prices) on the expenditure side as well as the production side.[6] The analysis is conducted on the percentage change in the variable (relative to its value the same quarter one year earlier). Data range from the second quarter 1999 to the fourth quarter 2013.[7]

For the expenditure side, the analysis is conducted at a fairly high level of aggregation (see Table 1).[8] Exports and imports have been divided into goods and services.

GDP from the production side shows how the production is distributed between different industries and sectors. The analysis is conducted for the production in general government, non-profit institutions serving households and the business sector. The production in the business sector is also divided in to a number of industries (see Table 1). In 2011 the industry classification in the national accounts was altered due to a new version of the European industrial activity classification (NACE Rev.2).[9] The new data were published in connection with the regular publication of the second quarter 2011. The production in the business sector as a whole was not affected by the change of NACE, but new industries within the business sector were added and within some existing industries the growth numbers were changed substantially, in particular within the service sector. To avoid revisions that largely are a result of the change of NACE, the analysis of the production side is only conducted for industries that were unaffected or only slightly affected by the change of NACE.

[6] By real-time data we mean a set of different vintages of data. For a further discussion, see, for example, Croushore och Stark (2001) and Croushore (2011).

[7] For all quarters, the regular release has been used for analysis. That is, the first release for the second quarter (see footnote 1) is not used.

[8] It can be noted that inventories have not been included in the analysis. The reason for this is that inventories – unlike all other variables in this paper – normally are discussed in terms of their contribution to GDP growth. It is problamatic though to conduct analysis based on contributions to growth since revisions can be due to revisions in both the numerator (that is, the change in inventories) and the denominator (that is, GDP). To analyse the growth rate, as we have done for the other variables, is not considered informative since it can vary extremely much since the denominator in some cases can be very small.

[9] NACE Rev.2 is a statistical classification of economic activity to various industries.

Table 1 Variables included in the study

GDP and the expenditure side	Production side
GDP	General government production
Household consumption	Non-profit institutions serving households (NPISH)
General government consumption	Business sector (NACE A-U)
Gross fixed capital formation	Producers of goods (NACE A-F)
Exports	Agriculture, forestry and fishing (NACE A)
Exports of goods	Mining (NACE B)
Exports of services	Manufacturing (NACE C)
Imports	Construction (NACE F)
Imports of goods	Producers of services (NACE G-U)
Imports of services	Trade (NACE G)
	Financial services (NACE K)
	Real estate services (NACE L)

Source: Statistics Sweden.

3 Method

The revisions are defined according to

$$r_{j,t} = x_{j,t} - x_{f,t} \qquad (1)$$

where $x_{f,t}$ is the first release for quarter t for a particular variable and $x_{j,t}$ is the release for quarter t published j quarters later. We conduct our analysis for $j = (1,2,\dots,7,s)$, where s is the latest data vintage published by Statistics Sweden.[10]

As was pointed out in the introduction, we study three aspects of the revisions – volatility, unbiasedness and forecast efficiency – using methods which are commonly employed in the literature; see, for example, Mankiw *et al.* (1984), Faust *et al.* (2005), Roodenburg and den Reijer (2006) and Aruoba (2008).

We measure **volatility** with the standard deviation. Since the volatility of the growth of different variables varies quite substantially, it is relevant to compare the volatility of the revisions to the volatility of the variable itself.[11] The volatility of the variables themselves is based on the latest vintage of the data. Since some variables were much more affected by the financial crisis than others, the volatility for the variables themselves is calculated for two periods, both the full sample and a sample which ends in the third quarter of 2008.

A test for **unbiasedness** can be conducted by running the regression

[10] The latest data vintage in this study is the one published in February 2014 which contains data up to and including 2013Q4.

[11] It should be noted though that it is not necessarily the case that a variable with high volatility is revised more than a variable with low volatility.

$$r_{j,t} = c + e_t \quad (2)$$

where e_t is an error term. The null hypothesis $H_0: c = 0$ is tested using a simple *t*-test.[12] If the null hypothesis is rejected, it is concluded that the growth rate released initially for a certain quarter is not an unbiased estimate of later releases. In the cases where $c > 0$, the first release has underestimated later ones; if $c < 0$, it has been overestimated.

Forecast efficiency implies that the revisions are uncorrelated with information which was available the time of the first release. If this is not the case, it might to some extent be possible to improve the data being published by Statistics Sweden. One way to test for forecast efficiency is to run the regression

$$r_{j,t} = c + \beta x_{f,t} + e_t \quad (3)$$

and then test whether the null hypothesis $H_0: c = \beta = 0$ can be rejected using a Wald test. If, for example, $\beta > 0$ then higher values of the first release is associated with higher values of the revision. This means that the first release was not an efficient forecast.[13]

The efficiency test can be generalised to also take into account other information which was available at the time of the first release. In this paper, we consider two variables which can be presumed to have information concerning the state of the business cycle, namely the three-month treasury bill rate (i_t) and the new export orders in the manufacturing industry (s_t) as measured in the *Economic Tendency Survey*. The estimated equation is given by

$$r_{j,t} = c + \beta x_{f,t} + \gamma_1 i_t + \gamma_2 s_t + e_t \quad (4)$$

and the null hypothesis $H_0: c = \beta = \gamma_1 = \gamma_2 = 0$ is tested using a Wald test.[14]

4 Results

4.1 The expenditure side

A brief overview of the results can be found in Table 2. Tables with all results can be found in the appendix.

[12] Newey-West standard errors are used to address the serial correlation (and heteroskedasticity) in the residuals.

[13] This is a traditional test of forecast efficiency; see, for example, Mincer and Zarnowitz (1969).

[14] It can be noted that for both equation (3) and (4), the probability that the null hypothesis is rejected increases if bias has been established by finding that c≠0 in equation (2).

Table 2 Summary of results for the expenditure side

	Revision	Volatility ratio	Unbiasedness	Mincer–Zarnowitz	General efficiency
GDP	j=1	0,1	0,0	1,1	0,6
	j=s	0,2	0,3[b]	3,2[b]	3,9[a]
Household consumption	j=1	0,4	0,0	0,7	0,4
	j=s	0,4	0,5[a]	6,6[a]	4,9[a]
General government consumption	j=1	0,4	0,0	2,5	2,1
	j=s	0,7	–0,1	7,1[a]	4,2[a]
Gross fixed capital formation	j=1	0,2	-0,3	1,8	1,2
	j=s	0,3	0,4	0,9	0,6
Exports	j=1	0,1	0,4[a]	14,3[a]	7,3[a]
	j=s	0,2	0,6[b]	2,9	4,3[a]
Exports of goods	j=1	0,1	0,1	1,9	3,9[a]
	j=s	0,1	0,3	1,5	1,1
Exports of services	j=1	0,3	1,3[a]	12,4[a]	8,0[a]
	j=s	0,6	1,9[b]	3,7[b]	5,1[a]
Imports	j=1	0,1	0,4[a]	9,8[a]	10,2[a]
	j=s	0,2	0,7[a]	4,6[b]	5,9[a]
Imports of goods	j=1	0,1	0,4[a]	10,4[a]	5,3[a]
	j=s	0,1	0,8[a]	8,7[a]	7,2[a]
Imports of services	j=1	0,3	0,4	3,9[b]	4,4[a]
	j=s	0,6	0,2	0,7	3,5[b]

Note: ”Volatility ratio” is the standard deviation for the revision divided by the standard deviation for the variable (measured over the period 1999Q2-2013Q4). ”Unbiasedness” gives the parameter estimate $\hat{c}$ from equation (2), which is the same as the average revision on the horizon in question. ”Mincer-Zarnowitz” gives the test statistic from the Wald test related to equation (3). ”General efficiency” gives the test statistic from the Wald test related to equation (4). ”a” and ”b” indicates that the relevant null hypothesis can be rejected at the one and five percent level respectively.

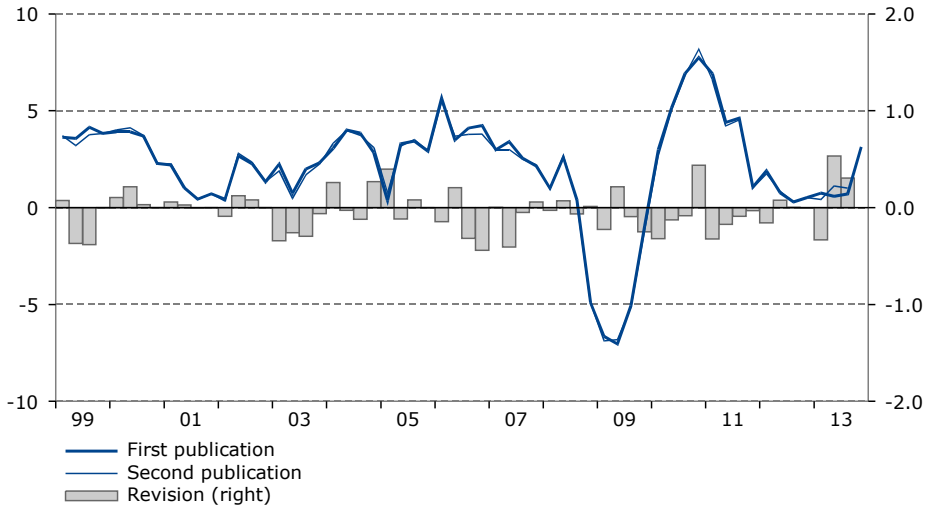
Sources: Statistics Sweden and the National Institute of Economic Research.

4.1.1 VOLATILITY

As can be seen from Table 2 above and Table 4 to Table 13 in the appendix, the volatility in the revisions is larger the longer the revision horizon. For GDP, this is illustrated in Figure 1 and Figure 2 below. Figure 1 shows time series with the first and second release of GDP growth and the revision between these two series *(j=1)*. Figure 2 shows time series with the first and latest release (February 2014) and the revision between these two series *(j=s)*. That longer revision horizons are associated with higher volatility in the revisions is expected since the data should be revised more compared to the initial release as better sources become available.

Figure 1 GDP

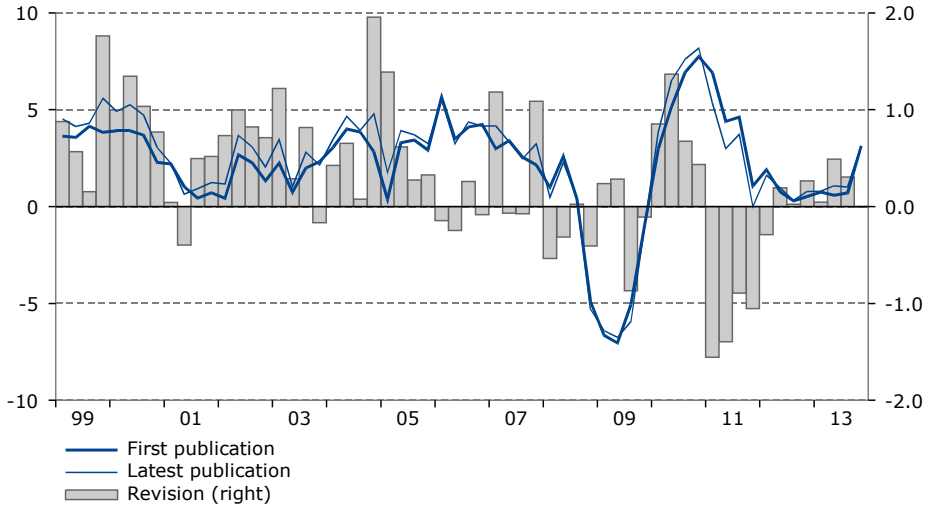
Percentage change and percentage points, respectively



Sources: Statistics Sweden and the National Institute of Economic Research.

Figure 2 GDP

Percentage change and percentage points, respectively



Sources: Statistics Sweden and the National Institute of Economic Research.

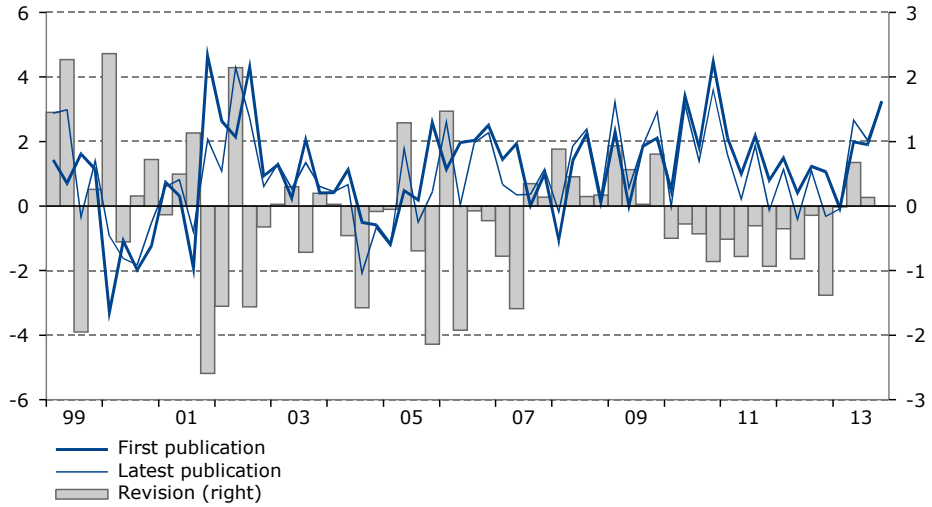
For a number of variables – GDP, exports, exports of goods, imports, imports of goods and gross fixed capital formation – the ratio between the volatility at the horizon $j=s$ and the volatility in the variable itself is only 0.3 or lower. The growth rate of some variables was more affected by the financial crisis than that of others. When comparing the volatility of the revisions (for the full period) to the volatility of the variable for the period 1999Q2 to 2008Q3 – that is, excluding the financial crisis and the period thereafter – the ratio for GDP and gross fixed capital formation rises to almost 0.5.

The most problematic variables when it comes to the volatility of the revisions are primarily general government consumption and exports of services. The revisions for

these two variables at the horizon $j=s$ are shown in Figure 3 and Figure 4. At this horizon, the ratio between the revisions and the volatility in the variable itself is over 0.7 for general government consumption and 0.6 for exports of services. This is a magnitude of the ratio which is not unproblematic since the analysis of initially published data is made more difficult.

Figure 3 General government consumption

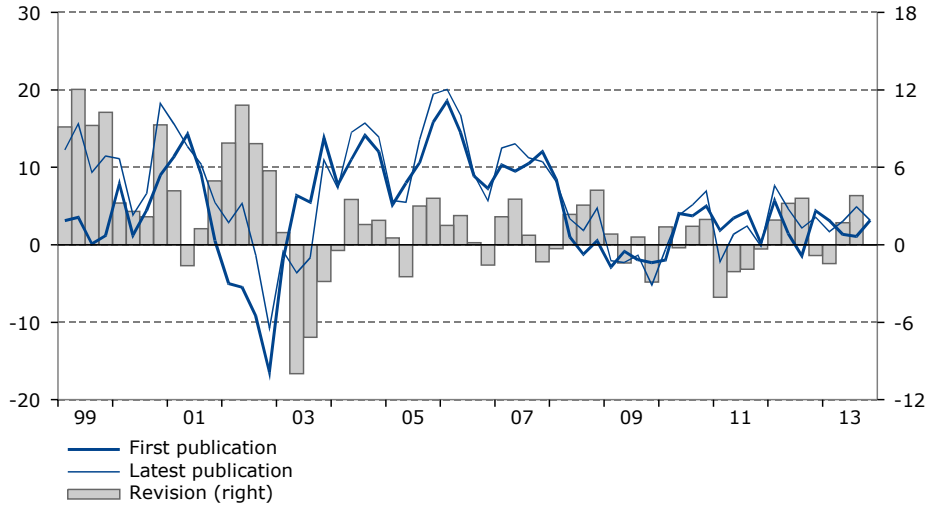
Percentage change and percentage points, respectively



Sources: Statistics Sweden and the National Institute of Economic Research.

Figure 4 Exports of services

Procentuell förändring respektive procentenheter



Sources: Statistics Sweden and the National Institute of Economic Research.

4.1.2 UNBIASEDNESS

With respect to unbiasedness, general government consumption, exports of goods, imports of services and gross fixed capital formation appear to be the variables with the best properties. No statistical significance can be established for these variables.

For GDP and household consumption, significant results are found at horizon *j=s*. Since the estimated coefficient is positive, this indicates that the initial release has underestimated the final release.

For both exports and imports, the test indicates – at all horizons – that the initial release is not an unbiased estimate of later releases. For exports, this bias turns out to have its origin in the exports of services where significance is established at all horizons. The bias in imports is due to the imports of goods; also in this case, significance is established at all horizons. The estimated coefficients are all positive, again indicating that the initial release has underestimated later releases.

4.1.3 FORECAST EFFICIENCY

The results from the conducted efficiency tests indicate that only one variable passes all tests without remarks, namely gross fixed capital formation. For GDP, significance is established at the revision horizon *j=s* for both the Mincer-Zarnowitz test and the more general efficiency test. This is not particularly surprising though given the bias that was found at the same horizon. Looking at the estimated equations in more detail though, it turns out that in the general efficiency test, the coefficients on both i_t and s_t are significant (if only at the ten percent level).[15] Also for household consumption both efficiency tests show significance at the revision horizon *j=s*.

More substantial shortcomings can be found for a number of variables. For general government consumption, significant results are found at all horizons except *j=1,2* for both tests.[16] For imports, both tests indicate shortcomings concerning efficiency at all horizons. The same is true for exports, except at the horizon *j=s*.[17] The results for imports are largely due to problems with the imports of goods. The import of services is significant only for *j=1* and *j=1,2,s* for the two tests respectively. The results for exports are to a large extent driven by the export of services where significant results are found at all horizons for both tests; the exports of goods show significant results only in a few cases.

It should be kept in mind though that shortcomings concerning efficiency that have been established not necessarily are easy to turn into improved initial data releases. The results above should therefore not be interpreted as – in the cases where significant results were found – that Statistics Sweden could have done a better job. Rather, significant results indicate where it might be possible to make improvements.

4.2 The production side

A brief overview of the results can be found in Table 3. Tables with all results can be found in the appendix.

[15] Results are not reported in detail here but are available from the authors upon request.

[16] This result is generally due to the coefficient β being significant.

[17] As was the case for GDP above, this was not unexpected given that bias had already been established.

Table 3 Summary of results for the production side

	Revision	Volatility ratio	Unbiasedness	Mincer–Zarnowitz	General efficiency
General government production	j=1	0,3	0,1	13,3[a]	8,5[a]
	j=s	0,9	-0,2	2,8	2,4
Non-profit institutions serving households	j=1	0,1	0,1	0,8	0,6
	j=s	0,3	-0,8	10[a]	5,6[a]
Business sector	j=1	0,1	-0,1	2,5	4,1[a]
	j=s	0,3	0,5[a]	4,0[b]	5,9[a]
Producers of goods	J=1	0,1	-0,1	2,7	2,9[b]
	j=s	0,4	0,6	1,1	3,1[b]
Agriculture, forestry and fishing	j=1	0,3	-0,1	0,1	1,2
	j=s	1,0	1,5	3,3[b]	6,2[a]
Mining	j=1	0,1	0,0	3,2[b]	1,8
	j=s	0,7	-3,8[b]	2,8	3,6[b]
Manufacturing	j=1	0,1	-0,1	1,0	1,1
	j=s	0,4	1,7[b]	3,3[b]	3,7[a]
Construction	j=1	0,2	-0,3[b]	3,0	1,7
	j=s	0,9	-2,9[a]	10,4[a]	7,2[a]
Producers of services	j=1	0,2	-0,0	0,3	0,4
	j=s	0,4	0,5[b]	3,6[b]	2,2
Trade	j=1	0,2	0,0	2,3	3,8[a]
	j=s	0,7	0,4	3,8[b]	10,6[a]
Financial services	j=1	0,8	0,0	3,6[b]	1,9
	j=s	1,1	1,5	21,7[a]	13,9[a]
Real estate services	j=1	0,2	0,0	7,0[a]	3,6[b]
	j=s	0,8	0,7	1,7	1,0

Note: ”Volatility ratio” is the standard deviation for the revision divided by the standard deviation for the variable (measured over the period 1999Q2-2013Q4). ”Unbiasedness” gives the parameter estimate $\hat{c}$ from equation (2), which is the same as the average revision on the horizon in question. ”Mincer-Zarnowitz” gives the test statistic from the Wald test related to equation (3). ”General efficiency” gives the test statistic from the Wald test related to equation (4). ”a” and ”b” indicates that the relevant null hypothesis can be rejected at the one and five percent level respectively.

Sources: Statistics Sweden and the National Institute of Economic Research.

4.2.1 VOLATILITY

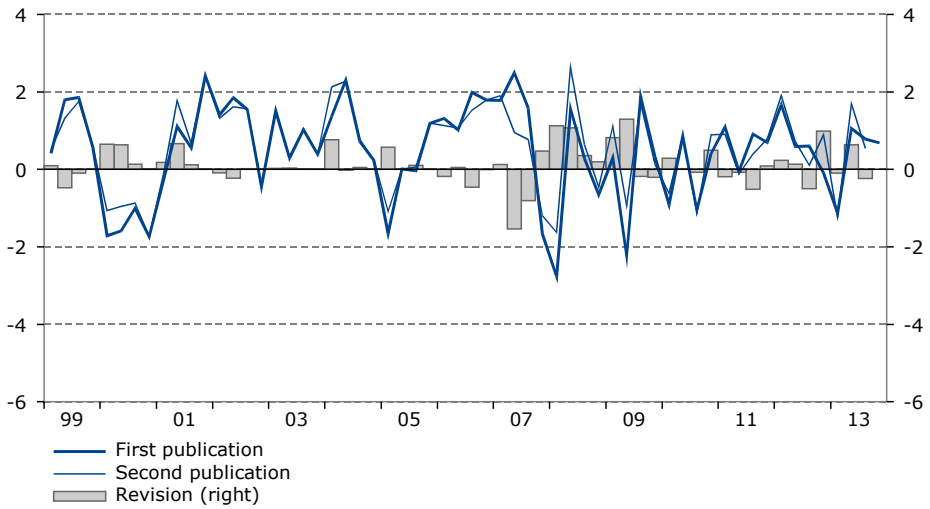
As can be seen from Table 3 above and Table 14 to Table 25 in the appendix the volatility of the revisions of the production side, like the expenditure side, increases when the revision horizon is extended and better sources become available. The volatility of the revisions for general government production – a variable which make up approximately 20 percent of GDP – is considerable already in the second publication, and even higher in the latest.

Figure 5 shows time series with the first and second release of general government production growth and the revision between these two series *(j=1)*. Figure 6 shows time series with the first and latest release (February 2014) and the revision between these two series *(j=s)*. The ratio between the first revision horizon *(j=1)* and the volatility of the variable itself is 0.3. The ratio between the latest revision horizon *(j=s)* and

the volatility of the variable itself is 0.9, which means that it is difficult to draw any conclusion about production from the first data published. General government production was not affected that much by the financial crisis. The volatility of this variable is even smaller for the long period than for the short period that excludes the financial crisis and the subsequent period. The ratio between the latest revision horizon *(j=s)* and the volatility in the variable itself for the short period therefore falls to 0.8.

Figure 5 General government production

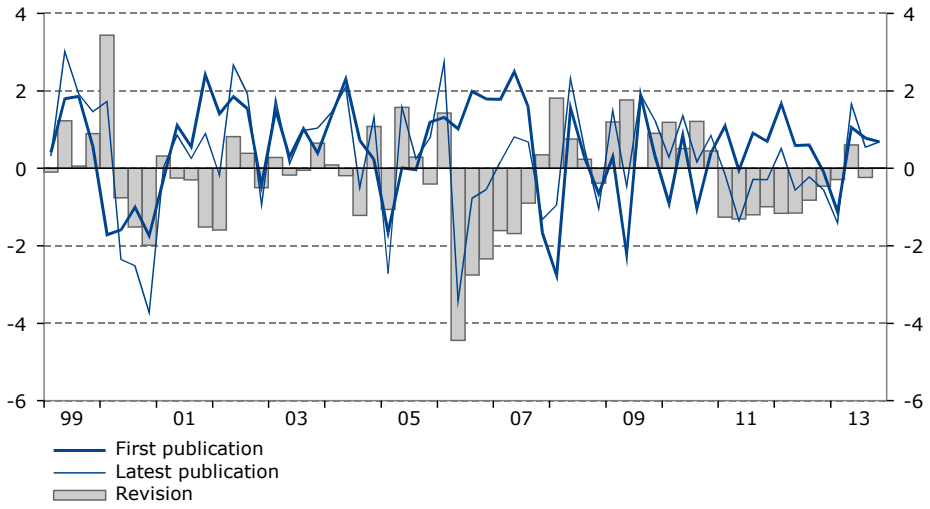
Percentage change and percentage points, respectively



Sources: Statistics Sweden and the National Institute of Economic Research.

Figure 6 General government production

Percentage change and percentage points, respectively



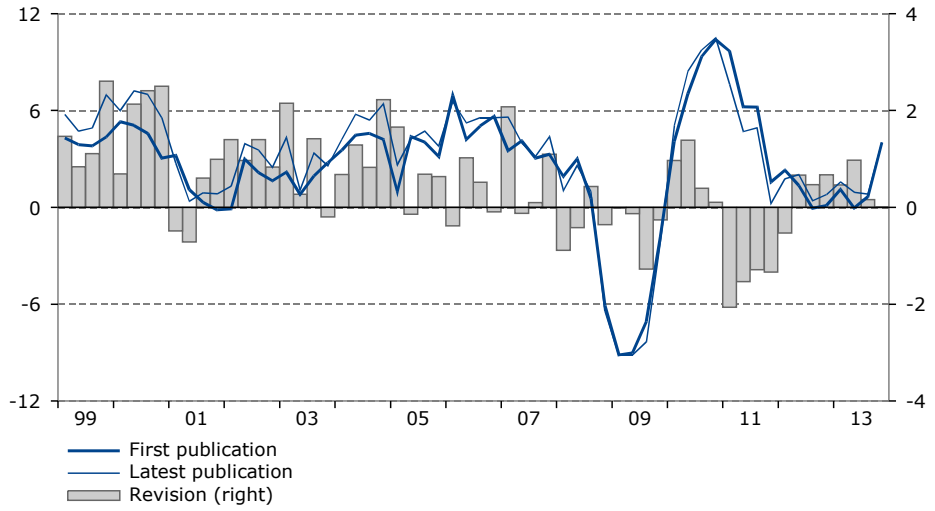
Sources: Statistics Sweden and the National Institute of Economic Research.

The volatility of the revisions of business sector production is smaller than that of general government production. The ratio between the volatility of the revisions for horizon *j=s* and the volatility of the variable itself is 0.3, which is the same as for non-profit institutions serving households. The volatility of the growth rate of the business sector, however, has been unusually large in the period after the financial crisis (see

Figure 7). The ratio therefore rises to 0.5 when calculated for the second quarter 1999 to the third quarter 2008 (excluding the financial crisis and the subsequent period).

Figure 7 Business sector

Percentage change and percentage points, respectively

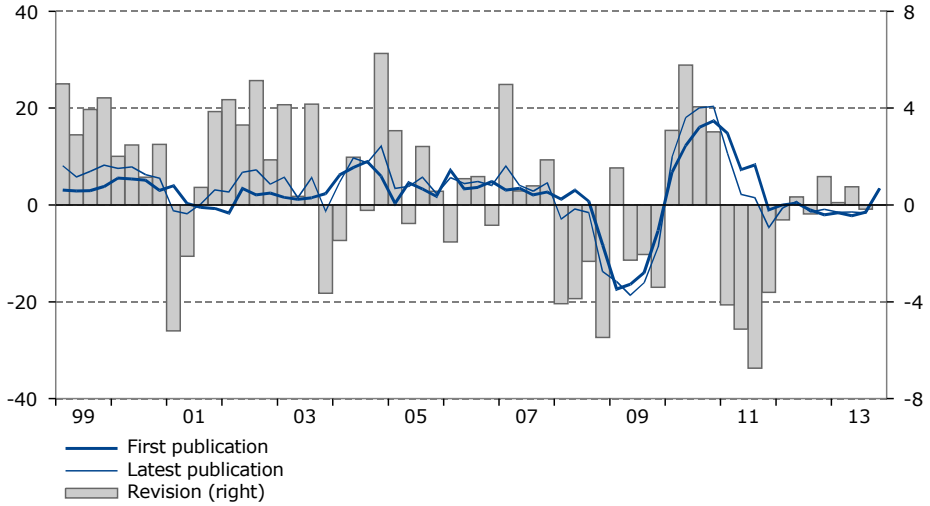


Sources: Statistics Sweden and the National Institute of Economic Research.

The volatility of the revisions for the different industries is higher than for the business sector as a whole. Figure 8 and Figure 9 show time series with the first and the latest release and the revision between these two series *(j=s)* for the producers of goods and the producers of services. The ratio between the volatility of the revisions at horizon *j=s* and the volatility of the variable itself is 0.4 for both aggregates. In a comparison with the volatility of the variable itself for the short period excluding the financial crisis and the subsequent period, the picture is different. The ratio between the volatility of the revisions for *j=s* and the volatility of the variable itself rises to 0.9 for the producers of goods and to 0.6 for the producers of services. The difference is mainly explained by the fact that it primarily was producers of goods, in particular manufacturing, that was hit by the financial crisis. Growth fell sharply first and then rose strongly, which means that the volatility is considerably higher if one includes the financial crisis and the subsequent period (see Table 17 and Table 22).

Figure 8 Producers of goods

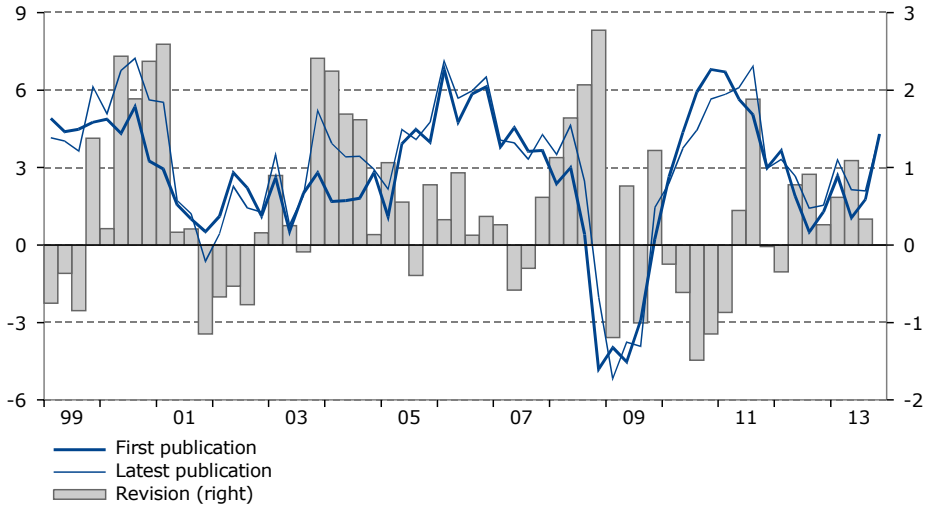
Percentage change and percentage points, respectively



Sources: Statistics Sweden and the National Institute of Economic Research.

Figure 9 Producers of services

Percentage change and percentage points, respectively



Sources: Statistics Sweden and the National Institute of Economic Research.

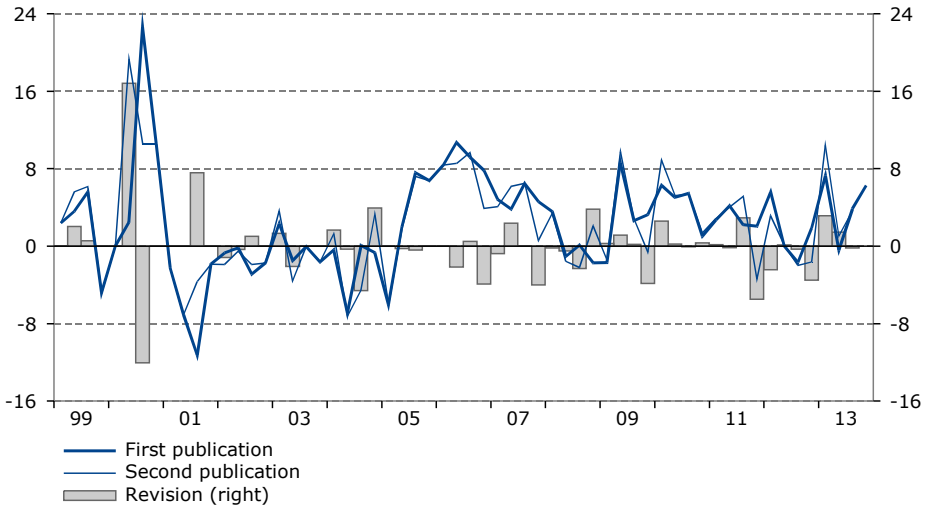
Concerning the different industries within the producers of goods, the ratio between the volatility at the horizon $j=s$ and the volatility in the variable itself is 0.4 for manufacturing and 0.7 for mining. The ratio for agriculture, forestry and fishing is 1.0. The ratio for construction is also considerable and amounts to 0.9. In a comparison with the volatility of the variable itself for the short period excluding the financial crisis and the subsequent period, the ratio is approximately 1.0 for manufacturing, mining and agriculture, forestry and fishing. The corresponding figure for construction is 0.9. All the analysed industries within goods production are thus revised substantially.

The volatility in the revisions for the industries within the service sector shows that production of financial services is revised considerably already in the second publica-

tion (see Figure 10). The ratio between the volatility at the first revision horizon and the volatility in the variable itself is 0.8. Compared with the latest revision horizon the ratio rises to 1.1, which means that the volatility in the revisions is greater than the volatility in the variable itself.

Figure 10 Financial services

Percentage change and percentage points, respectively



Sources: Statistics Sweden and the National Institute of Economic Research.

Revisions of growth numbers in production of trade and production of real estate services are also relatively large, but mainly at the latest revision horizon. The ratio between the volatility at the first revision horizon *(j=1)* and the volatility in the variable itself is 0.2 for both industries, but gradually increases to 0.7 for the production of trade and to 0.8 for real estate services.

One potential explanation for the finding that revisions of the production side generally appear to be associated with a higher volatility than the revisions of the expenditure side is that there is an important difference between the quarterly and the annual estimates of the national accounts for the production side. More specifically, the quarterly estimates lack information on intermediate consumption in different industries. This means that Statistics Sweden is forced to make assumptions about input coefficients. The assumption is normally an unchanged input coefficient from the latest annual estimate. The revisions in connection with the annual estimates could therefore be considerable if the coefficients change substantially. However, establishing the exact importance of this issue would mean that one would have to have access to very detailed data from Statistics Sweden; such data are not available.

4.2.2 UNBIASEDNESS

The test for unbiasedness indicates that the initial release is not an unbiased estimate of the final release for the production in the business sector and the production of services. The positive coefficient indicates that the initial publication underestimates the latest publication. The production of goods, on the other hand, appears to be an unbiased estimate at all horizons. The production of services accounts for almost 70

per cent of business sector production and the bias in service production thereby explains the biased estimate of business sector production as a whole at horizon *j=s*.

As regards the different industries within the goods production the test shows that the initial publications of manufacturing, mining and construction are associated with bias at horizons *j=s, j=7,s* and *j=1,6,7,s* respectively.[18] The coefficients for the different industries, however, seem to cancel each other out, which means that the producers of goods as a whole still seems to be an unbiased estimate at all horizons. The coefficient for agriculture, forestry and fishing amounts to 1.5 at the latest revision horizon, and even though it is not significant it could potentially be seen as a problem due to the size of the point estimate.

As for the different industries within the service sector it is difficult to find any statistically significant bias. The coefficient for production of trade is not significant at any horizon. The coefficient for production of financial services is large and amounts to 1.5 at the latest revision horizon *j=s*, which indicates that the initial publication is an underestimation. The coefficient, however, is not significantly different from zero. The coefficient for production of real estate services is also positive and significant at the seventh revision horizon, but not at *j=s*. The test thus shows that the initial publication is an unbiased estimate of the latest publication.

4.2.3 FORECAST EFFICIENCY

The results from the two conducted efficiency tests indicate that no variable on the production side passes without remarks. For the production in general government, significance is established at the first seven revision horizons in the Mincer-Zarnowitz test (see equation 3), but not at *j=s*. The more general test (see equation 4) is significant at the first five revision horizons.

As for production in the business sector as a whole the Mincer-Zarnowitz test is only significant at the revision horizon *j=s*. This is not particularly surprising though given the bias that was found at the same horizon. The more general test, however, is significant for both the first and the seventh revision horizon, which indicates that the revision of the production in the business sector is correlated with information available at the time of the first data release. The general test is also significant at revision horizon *j=s*. When interpreting this result one should keep in mind that, like with the Mincer-Zarnowitz test, bias already was established at the horizon *j=s*.

All industries within the business sector display shortcomings in terms of efficiency (see Table 17 to Table 25). The results for the main aggregates – producers of goods and producers of services – appear to be somewhat better than for the smaller industry aggregates. The general test is significant for the producers of goods at the revision horizons *j=1,7,s*, while it is only the Mincer-Zarnowitz test that is significant for the producers of services and only at the revision horizon *j=s*. This is, similar to the case of the business sector, not unexpected since bias already has been established at this horizon. For production of financial services the Mincer-Zarnowitz test is significant at all revision horizons and the general test is significant at all horizons except *j=1*.

[18] The high negative coefficient for construction is partly due to a single major revision made in September 2013, when growth in construction production in 2011 was revised down by more than 10 percentage points.

Regarding production of trade the Mincer-Zarnowitz test is only significant at the revision horizon $j=s$, while the general test is significant at all horizons.

5 Conclusions

In this paper, we have studied revisions of Swedish national accounts data with respect to volatility, unbiasedness and forecast efficiency. Results indicate that the properties of the revisions are more problematic for the production side than for GDP and the expenditure side.

The volatility of the revisions of GDP and most of the variables on the expenditure side is relatively low. There are exceptions though – both the exports of services and general government consumption are associated with reasonably high volatility. As for the production side the volatility in the revisions is relatively large for most aggregates except the business sector as a whole and non-profit institutions serving households. The production of financial services stands out with substantial revisions even at the first revision horizon.

Concerning unbiasedness, there are signs of a systematic underestimation for GDP, household consumption, exports and imports. The production side also displays shortcomings. The first publication of business sector production is not an unbiased estimate of the final number – the growth rate has on average been revised up. This is largely because the initial release for service production tends to be an underestimate. The production of goods, on the other hand, appears to be an unbiased estimate, but there are indications that the initial publication is biased for several of the industries within the production of goods.

With respect to forecast efficiency, shortcomings have been established for a number of variables. Exports and imports appear most problematic on the expenditure side. The production of trade and the production of financial services seem to be the most problematic on the production side.

Taken together, our results indicate that there are problematic aspects of the properties of the revisions. The shortcomings concerning unbiasedness and forecast efficiency which have been established indicate that there might be possibilities to improve the production of the national accounts data. Systematic over- or underestimation is not desirable since it, for example, can make it harder for forecasters to generate forecasts associated with high forecast precision. As far as possible, the causes of these shortcomings should be investigated so that they can be addressed. The high volatility which has been found in some of the revisions – particularly on the production side – is not a welcome feature either and leads us to conclude that it is difficult to make strong statements concerning the production in the smaller industry aggregates based on the initial data release; it also limits the possibility to make good forecasts at an industry level. There is a relatively high demand for detailed industry data and forecasts. Users of data and forecasts should be aware of the problems identified in this study though. The high volatility established in some cases is of course unfortunate but it might not be easy to address this problem since a fairly large share of it likely is due to incomplete sources. A possible solution could be to expand the quarterly gathering of data, but even if that would lead to enhanced industry statistics it is not obvious that the social benefits of it is positive since it would imply an increased burden on respondents.

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7 Appendix

Table 4 GDP

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,2	0,0	1,1	0,6
Revision j=2	0,3	0,0	0,8	2,0
Revision j=3	0,3	0,0	0,2	2,1
Revision j=4	0,4	0,0	0,3	0,7
Revision j=5	0,4	0,0	0,6	1,3
Revision j=6	0,5	0,0	1,3	1,1
Revision j=7	0,6	0,1	1,7	1,8
Revision j=s	0,7	0,3[b]	3,2[b]	3,9[a]
Data 1999:2–2008:3	1,5	-	-	-
Data 1999:2–2013:4	3,0	-	-	-

Note: ”Volatility” is the standard deviation for the revision and the standard deviation for the variable itself measured over two different periods. ”Unbiasedness” gives the parameter estimate $\hat{c}$ from equation (2), which is the same as the average revision on the horizon in question. ”Mincer-Zarnowitz” gives the test statistic from the Wald test related to equation (3). ”General efficiency” gives the test statistic from the Wald test related to equation (4). ”a” and ”b” indicates that the relevant null hypothesis can be rejected at the one and five percent level respectively.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 5 Household consumption

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,7	0,0	0,7	0,4
Revision j=2	0,8	0,0	0,1	0,2
Revision j=3	0,6	0,0	0,2	0,1
Revision j=4	0,6	0,1	0,4	0,5
Revision j=5	0,6	0,1	0,2	0,8
Revision j=6	0,6	0,1	0,3	0,6
Revision j=7	0,7	0,1	0,6	0,5
Revision j=s	0,8	0,5[a]	6,6[a]	4,9[a]
Data 1999:2–2008:3	1,5	-	-	-
Data 1999:2–2013:4	1,8	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 6 General government consumption

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,5	0,0	2,5	2,1
Revision j=2	0,7	0,0	1,8	1,2
Revision j=3	0,9	0,0	5,6[a]	2,8[b]
Revision j=4	0,9	0,0	7,4[a]	3,7[b]
Revision j=5	1,0	0,0	5,9[a]	3,6[b]
Revision j=6	1,0	0,0	4,2[b]	4,1[a]
Revision j=7	1,0	0,0	10,5[a]	7,9[a]
Revision j=s	1,0	–0,1	7,1[a]	4,2[a]
Data 1999:2–2008:3	1,4	-	-	-
Data 1999:2–2013:4	1,4	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 7 Gross fixed investment

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	1,5	-0,3	1,8	1,2
Revision j=2	1,5	–0,2	0,9	1,2
Revision j=3	1,7	–0,3	1,2	0,8
Revision j=4	1,9	–0,3	1,2	0,6
Revision j=5	1,9	–0,3	1,2	0,6
Revision j=6	1,9	–0,3	1,3	0,7
Revision j=7	2,1	–0,2	0,5	0,3
Revision j=s	2,2	0,4	0,9	0,6
Data 1999:2–2008:3	4,6	-	-	-
Data 1999:2–2013:4	7,2	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 8 Exports

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,5	0,4[a]	14,3[a]	7,3[a]
Revision j=2	0,6	0,4[a]	15,1[a]	8,9[a]
Revision j=3	0,8	0,4[a]	8,1[a]	6,7[a]
Revision j=4	0,9	0,4[a]	5,8[a]	5,7[a]
Revision j=5	1,0	0,5[a]	5,7[a]	3,9[a]
Revision j=6	1,1	0,5[a]	6,1[a]	3,6[b]
Revision j=7	1,1	0,5[a]	4,9[b]	4,7[a]
Revision j=s	1,4	0,6[b]	2,9	4,3[a]
Data 1999:2–2008:3	4,2	-	-	-
Data 1999:2–2013:4	7,0	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 9 Exports of goods

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,6	0,1	1,9	3,9[a]
Revision j=2	0,7	0,0	1,9	1,5
Revision j=3	0,9	0,0	4,6[b]	2,0
Revision j=4	0,9	0,0	2,3	0,9
Revision j=5	1,0	0,0	0,0	0,4
Revision j=6	1,1	0,0	0,3	0,9
Revision j=7	1,0	0,0	0,4	1,1
Revision j=s	1,2	0,3	1,5	1,1
Data 1999:2–2008:3	4,6	-	-	-
Data 1999:2–2013:4	8,6	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 10 Exports of services

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	1,9	1,3[a]	12,4[a]	8,0[a]
Revision j=2	2,1	1,5[a]	18,1[a]	13,6[a]
Revision j=3	2,6	1,8[a]	10,4[a]	12,4[a]
Revision j=4	2,9	1,9[a]	8,9[a]	10,4[a]
Revision j=5	3,2	2,1[a]	8,4[a]	11,3[a]
Revision j=6	3,3	2,0[a]	6,2[a]	6,5[a]
Revision j=7	3,3	2,3[a]	7,7[a]	6,5[a]
Revision j=s	4,1	1,9[b]	3,7[b]	5,1[a]
Data 1999:2–2008:3	6,8	-	-	-
Data 1999:2–2013:4	6,6	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 11 Imports

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,6	0,4[a]	9,8[a]	10,2[a]
Revision j=2	0,7	0,4[a]	12,8[a]	7,4[a]
Revision j=3	0,8	0,5[a]	12,0[a]	7,1[a]
Revision j=4	0,9	0,5[a]	10,1[a]	7,1[a]
Revision j=5	0,9	0,5[a]	8,8[a]	5,9[a]
Revision j=6	1,0	0,4[a]	5,1[a]	3,5[b]
Revision j=7	1,0	0,6[a]	8,5[a]	5,9[a]
Revision j=s	1,2	0,7[a]	4,6[b]	5,9[a]
Data 1999:2–2008:3	4,9	-	-	-
Data 1999:2–2013:4	7,4	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 12 Imports of goods

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,6	0,4[a]	10,4[a]	5,3[a]
Revision j=2	0,7	0,4[a]	12,2[a]	5,8[a]
Revision j=3	0,8	0,6[a]	20,8[a]	13,8[a]
Revision j=4	1,0	0,6[a]	9,2[a]	5,3[a]
Revision j=5	1,1	0,6[a]	7,5[a]	4,6[a]
Revision j=6	1,2	0,6[b]	6,9[a]	4,1[a]
Revision j=7	1,3	0,7[a]	6,3[a]	3,4[b]
Revision j=s	1,2	0,8[a]	8,7[a]	7,2[a]
Data 1999:2–2008:3	5,7	-	-	-
Data 1999:2–2013:4	8,9	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 13 Imports of services

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	1,8	0,4	3,9[b]	4,4[a]
Revision j=2	1,9	0,2	3,0	3,1[b]
Revision j=3	2,5	0,2	2,7	1,7
Revision j=4	2,5	0,1	2,0	1,3
Revision j=5	2,8	0,2	1,3	0,8
Revision j=6	2,9	0,2	0,7	1,5
Revision j=7	2,8	0,3	1,0	1,6
Revision j=s	3,1	0,2	0,7	3,5[b]
Data 1999:2–2008:3	5,3	-	-	-
Data 1999:2–2013:4	5,7	-	-	-

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 14 General government production

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,5	0,1	13,3[a]	8,5[a]
Revision j=2	0,6	0,1	6,5[a]	4,8[a]
Revision j=3	0,8	0	7,3[a]	3,9[a]
Revision j=4	0,8	0	6,3[a]	3,3[b]
Revision j=5	1,1	–0,2	5,1[a]	2,7[b]
Revision j=6	1,1	–0,2	4,1[b]	2,1
Revision j=7	1,1	–0,2	3,2[b]	2,1
Revision j=s	1,3	–0,2	2,8	2,4
Data 1999:2–2008:3	1,7	–	–	–
Data 1999:2–2013:4	1,5	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 15 Non-profit institutions serving households

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,5	0,1	0,8	0,6
Revision j=2	0,7	0,2	1,6	1,8
Revision j=3	1,5	0,3	1,4	0,8
Revision j=4	2,1	0,4	2,3	1,4
Revision j=5	2,6	0,6	7,4[a]	5,7[a]
Revision j=6	3,0	0,8	108,0[a]	57,4[a]
Revision j=7	3,3	0,5	1,5	1,3
Revision j=s	2,8	–0,8	10,0[a]	5,6[a]
Data 1999:2–2008:3	10,3	–	–	–
Data 1999:2–2013:4	8,5	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 16 Business sector (NACE A–U)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,3	-0,1	2,5	4,1[a]
Revision j=2	0,4	0,0	0,4	0,4
Revision j=3	0,4	0,0	0,0	0,5
Revision j=4	0,5	0,0	0,3	0,4
Revision j=5	0,5	0,0	0,6	1,1
Revision j=6	0,6	0,1	2,0	2,5
Revision j=7	0,7	0,2	1,4	2,8[b]
Revision j=s	1,0	0,5[a]	4,0[b]	5,9[a]
Data 1999:2–2008:3	1,9	–	–	–
Data 1999:2–2013:4	4,0	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 17 Producers of goods (NACE A–F)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,6	-0,1	2,7	2,9[b]
Revision j=2	0,8	–0,1	2,3	1,3
Revision j=3	1,0	–0,1	2,8	1,4
Revision j=4	1,0	0,0	0,5	0,4
Revision j=5	1,0	0,0	0,0	0,4
Revision j=6	1,4	0,2	0,7	2,2
Revision j=7	1,9	0,3	0,7	2,9[b]
Revision j=s	3,1	0,6	1,1	3,1[b]
Data 1999:2–2008:3	3,5	–	–	–
Data 1999:2–2013:4	7,4	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 18 Agriculture, forestry and fishing (NACE A)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	1,9	-0,1	0,1	1,2
Revision j=2	2,3	-0,1	0,1	0,8
Revision j=3	2,4	-0,1	0,1	0,4
Revision j=4	2,3	0,1	0,3	0,4
Revision j=5	3,3	0,4	0,9	1,6
Revision j=6	4,4	0,8	2,4	2,1
Revision j=7	4,7	1,3	3,4[b]	3,6[b]
Revision j=s	5,6	1,5	3,3[b]	6,2[a]
Data 1999:2–2008:3	5,8	–	–	–
Data 1999:2–2013:4	5,7	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 19 Mining (NACE B)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	2,3	0,0	3,2[b]	1,8
Revision j=2	2,4	0,1	0,3	0,7
Revision j=3	3,4	0,7	0,9	1,5
Revision j=4	7,5	–0,1	7,1[a]	6,3[a]
Revision j=5	6,8	–0,3	8,7[a]	8,5[a]
Revision j=6	5,8	–0,8	14,2[a]	7,6[a]
Revision j=7	9,5	–2,5[b]	6,7[a]	4,1[a]
Revision j=s	10,8	–3,8[b]	2,8	3,6[b]
Data 1999:2–2008:3	9,7	–	–	–
Data 1999:2–2013:4	15,6	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 20 Manufacturing (NACE C)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,9	-0,1	1,0	1,1
Revision j=2	1,2	-0,1	1,4	0,7
Revision j=3	1,4	-0,2	2,6	1,2
Revision j=4	1,6	0,0	0,2	0,2
Revision j=5	1,7	0,1	0,1	0,1
Revision j=6	2,5	0,5	1,2	1,2
Revision j=7	3,1	1,0	2,2	3,4[b]
Revision j=s	4,5	1,7[b]	3,3[b]	3,7[a]
Data 1999:2–2008:3	4,5	–	–	–
Data 1999:2–2013:4	10,8	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 21 Construction (NACE F)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	1,3	-0,3[b]	3,0	1,7
Revision j=2	1,4	–0,2	0,8	1,0
Revision j=3	1,6	–0,2	0,5	0,6
Revision j=4	1,8	–0,5	1,9	1,2
Revision j=5	1,9	–0,6	2,1	1,5
Revision j=6	2,3	–1,0[b]	4,8[b]	5,4[a]
Revision j=7	3,3	–1,9[a]	10,3[a]	11,5[a]
Revision j=s	5,2	–2,9[a]	10,4[a]	7,2[a]
Data 1999:2–2008:3	5,8	–	–	–
Data 1999:2–2013:4	5,7	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 22 Producers of services (NACE G–U)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,5	0,0	0,3	0,4
Revision j=2	0,5	0,0	0,1	0,6
Revision j=3	0,6	0,1	0,9	1,5
Revision j=4	0,6	0,1	2,8	1,9
Revision j=5	0,7	0,1	1,4	1,7
Revision j=6	0,8	0,1	0,7	1,6
Revision j=7	0,9	0,1	0,4	1,5
Revision j=s	1,1	0,5[b]	3,6[b]	2,2
Data 1999:2–2008:3	1,9	–	–	–
Data 1999:2–2013:4	2,6	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 23 Trade (NACE G)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,9	0,0	2,3	3,8[a]
Revision j=2	1,1	0,0	2,4	8,2[a]
Revision j=3	1,2	0,1	1,4	6,2[a]
Revision j=4	1,4	0,1	0,3	4,4[a]
Revision j=5	1,7	0,1	0,3	4,9[a]
Revision j=6	2,0	−0,1	0,3	4,0[a]
Revision j=7	2,1	−0,3	0,6	4,0[a]
Revision j=s	2,8	0,4	3,8[b]	10,6[a]
Data 1999:2–2008:3	2,5	–	–	–
Data 1999:2–2013:4	3,8	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 24 Financial services (NACE K)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	3,5	0,0	3,6[b]	1,9
Revision j=2	3,9	0,2	9,4[a]	5,0[a]
Revision j=3	4,0	0,3	21,7[a]	12,0[a]
Revision j=4	4,0	0,4	24,8[a]	14,1[a]
Revision j=5	4,3	0,3	20,9[a]	13,1[a]
Revision j=6	4,2	0,4	19,0[a]	12,6[a]
Revision j=7	4,6	0,5	17,4[a]	14,5[a]
Revision j=s	4,9	1,5	21,7[a]	13,9[a]
Data 1999:2–2008:3	4,5	–	–	–
Data 1999:2–2013:4	4,5	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

Table 25 Real estate services (NACE L)

	Volatility	Unbiasedness	Mincer–Zarnowitz	General efficiency
Revision j=1	0,7	0,0	7,0[a]	3,6[b]
Revision j=2	0,9	0,1	6,5[a]	4,4[a]
Revision j=3	0,9	0,2	1,2	1,0
Revision j=4	0,9	0,2	1,2	1,2
Revision j=5	0,9	0,2	2,8	2,3
Revision j=6	1,2	0,2	8,2[a]	4,4[a]
Revision j=7	1,6	0,4[b]	14,5[a]	8,4[a]
Revision j=s	2,6	0,7	1,7	1,0
Data 1999:2–2008:3	3,0	–	–	–
Data 1999:2–2013:4	3,3	–	–	–

Note: See Table 4 for explanations.

Sources: Statistics Sweden and the National Institute of Economic Research.

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