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Assessing Efficiency of GDP Revisions in South Africa

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Abstract

Gross Domestic Product of any country often influence economic decisions by policy makers, market participants and econometricians on policy recommendations, evaluation and forecasting. However these decisions are often based on preliminary data announcements by statistical agencies. It is therefore important to ensure that the preliminary GDP announcements are efficient and can be relied on. This paper focuses on South Africa's preliminary announcements of quarterly GDP estimates by examining the relationship between the preliminary data and revised data using Ordinary Least Squares estimation technique. The results of this research suggest that the preliminary estimates of GDP, GDE, final consumption Expenditure by Households and by General Government for the period 1999Q1 to 2013Q4 are not efficient.

Keywords: GDP estimates, Preliminary announcements, Revisions, Efficient estimates.

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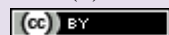
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1. Introduction

GDP influences economic decisions by policy makers. However these decisions are often based on preliminary data announcements by statistical agencies. This is mainly due to the need for timely data by users. It is well known that the statistical agencies have incomplete data when they release the preliminary estimates, and that the estimates are subsequently revised as more data becomes available.

An important question that is addressed in this paper is whether or not the preliminary GDP announcements should be relied on as efficient. Efficiency, in this case, is defined by McKenzie *et al.* (2008) as ensuring all available information at a particular time is being used in the most efficient way. According to McKenzie *et al.* (2008); Aruoba (2008); Garratt and Vahey (2006); Faust *et al.* (2005) and Sleeman (2005) having efficiently derived preliminary estimates implies that revisions are due solely to the incorporation of new information rather than the correction of systematic measurement errors. Revisions are unpredictable especially when using information set at the time of the initial announcement. However, the initial estimates should be an unbiased measure of the final estimate.

This paper focuses on seasonally adjusted and annualised national accounts aggregates at constant prices; namely, Gross Domestic Product, Gross Domestic Expenditure, Final Consumption Expenditure by Households, Final Consumption Expenditure by General Government, Gross Fixed Capital Formation, Exports of goods and services, Imports of goods and services, and Gross National Income.

2. Revisions to GDP Estimates

All initially published estimates of GDP and its components are subject to revisions. Ahmad *et al.* (2007) state that this is a normal feature of any statistical compilation process that estimates values for variables whose source data gradually improves over time, where the definition of the variable is subject to change, or where methodological changes occur.

2.1. Defining Revisions

Revisions are defined as any change in the value of an estimate initially published by a statistical agency (Carson *et al.*, 2004). According to Carson *et al.* (2004); Sleeman (2005) and Sim *et al.* (2009) the change in the value of initially published GDP estimates may come as a result of the following:

- Incorporation of more comprehensive data, and/or re-estimation of the seasonal factors for seasonally-adjusted series. These are routine revisions which occur in the weeks or months shortly after the initial announcement. For example when imputed values are being replaced by actual values or seasonal factors are being updated following later observations.
- Reconciliation of quarterly and annual measures. These constitute annual revisions for example when monthly or quarterly data are modified with more accurately based annual data.
- Rebasings and re-weighting of the constant price series or introduction of definitional or methodological changes. These are major revisions also referred to as comprehensive, or benchmark revisions. For example when there are major changes in statistical methods and/or changes in concepts, definitions, and classifications.

To formalize the discussion on revisions to GDP estimates, we express the revisions function as follows:

$$r_t^f = y_t^f - y_t^{t+1}$$

Where:

y_t^{t+1} = is the initial announcement of a variable that was realized at time t

y_t^f = is the final or true value of the same variable

r_t^f = is the final revision

Christoffersen *et al.* (2001) indicates that it is possible that the true final data for many economic series will never be available. This is because benchmark and definitional changes are ongoing and may continue into the indefinite future. However, Christoffersen *et al.* (2001) further states that in practice final data is defined as those revised figures available at some future point in time, which are no longer subject to revisions for example due to the addition of new information.

2.2. Uninformative and Informative Revisions

Depending on the reasoning and scheduling as discussed above, revisions to initially published GDP estimates are classified as either uninformative or informative revisions. Aruoba (2005) explains that uninformative revisions are those revisions that are a result of changes in the definition of the variable, or statistical changes such as the change of base year or reweighting. From the above discussions examples of uninformative revisions include major revisions when there are major changes in statistical methods and/or changes in concepts, definitions, and classifications. Informative revisions on the other hand carry informational content by reflecting the incorporation of new information which was not previously available to the statistical agency (Aruoba, 2005). Examples of informative revisions include routine revisions when imputed values are being replaced by actual values or seasonal factors being updated following later observations, and annual revisions when monthly or quarterly data are modified with more accurately based annual data. Furthermore the informational content carried by informative revisions is either news or noise.

2.3. Revisions: News or Noise

Ideally revisions should be due solely to the incorporation of new information. Revisions to GDP estimates are categorised as news when they bring new information which becomes available for the compilation of the later estimates. According to McKenzie *et al.* (2008) the incorporation of new information from the on-going flow of source data is important given that the general goal of the sequence of estimates is to approach some true value. This

is also an important issue for users of the data as they would expect that revisions are adding information to aid in their decision making processes, rather than providing random changes in previously published estimates.

Revisions to GDP estimates are categorised as noise when they are a result of the correction of earlier errors. McKenzie *et al.* (2008) state that when a revision to a variable contains noise it means that all or part of the revision does not contain any new information, rather the change in the estimate is due to systematic measurement errors that could arise from several factors such as biased estimates due to estimation based on non-representative samples, use of non-optimal imputation methodologies for imputing missing data.

2.4. Revisions and the Reliability of Preliminary GDP Estimates

Macroeconomic variables are universally important for decision and policy and this requires emphasis on the reliability of the estimates. The African Charter on Statistics and the International Monetary Fund's Data Quality Assessment Framework (DQAF) declare that the reliability of statistical outputs is a key dimension of statistical quality. According to Carson and Laliberte (2002); Mazzi and Cannata (2008) and McKenzie *et al.* (2008) the study of the information content embodied in succeeding revisions is one way to evaluate the reliability of earlier estimates. For example, the information about the expected reliability of existing and future values, the properties of the revisions process qualify the degree of confidence users may attribute to interpretations of the course of the indicator. From the perspective of producers, the properties of the revisions process may be used to monitor and better understand the characteristics of the statistical compilation process, enabling potential problems to be identified and improvements to be made.

The reliability of GDP revision estimates is affected by how national accounts aggregates are prepared and the inherent sources of error in estimates. In a given estimate there is a blending of information, for example the quarterly estimates are obtained by interpolating and extrapolating from the most recent annual estimates, and from quarterly and monthly indicators based largely on sample surveys and administrative data. Similarly, the annual estimates in many instances represent extrapolations or interpolations of information available in great detail in the censuses which are conducted every five or ten years. One source of error is that in some cases the coverage and definitions of the available data do not meet the requirements of the national accounts. Even if adjustments are made in an attempt to achieve the desired definitions, errors result. Another source of error is the sampling errors, and biases, inherent in the monthly and quarterly sample surveys used for the national quarterly estimates. The complete 'universe' counts used annually and for the benchmarks also contain biases and other non-sampling errors (see Young (1974)).

Notwithstanding how national accounts aggregates are prepared and taking into consideration the inherent sources of error in estimates, it is important that statistical agencies ensure that the information available at a particular time is being used in an efficient manner to compile their estimates.

3. Objectives of the Research

The objective of this study is to establish whether GDP revisions in South Africa are due solely to the incorporation of new information rather than the correction of systematic measurement errors.

4. The Data

Statistics South Africa and the South African Reserve Bank share responsibility for the compilation of national accounts. Statistics South Africa is responsible for compiling the production side of the national accounts, while the South African Reserve Bank is responsible for compiling the expenditure side of national accounts, as well as the income and savings and the balance of payments. Statistics South Africa and the South African Reserve Bank co-operate closely in revising the national accounts estimates at current as well as constant prices.

The data used in the study is sourced from Statistics South Africa and South African Reserve Bank Quarterly Bulletin. Statistics South Africa makes the first GDP announcement for a particular quarter, about 50-60 days after the end of the relevant quarter. The South African Reserve Bank publishes expenditure components in the South African Reserve Bank Quarterly Bulletin a few weeks after, about 70-80 days after the end of the relevant quarter. To derive the initial announcement (y_t^{t+1}), for each variable the study takes the first announced growth rate for the relevant quarter. To derive the final value (y_t^f), for each variable the study looks at the periods after which there are no more revisions except for benchmark and rebasing revisions. The growth rate final value used in the study therefore includes as many revisions as possible, but avoids the inclusion of benchmark and rebasing revisions. To derive the final revision (r_t^f), for each variable the study subtracts the growth rate final value from the first announced growth rate of the relevant quarter ($y_t^f - y_t^{t+1}$).

5. Analysis of the Revisions to GDP

The types of analysis used are similar to those recommended by McKenzie and Gamba, and employed by other studies (for example, see Van Walbeek (2006); McKenzie (2007); Sim *et al.* (2009) and Ahmad *et al.* (2007)).

5.1. Mean Revision

The key interest of this measure lies in its sign. When the mean revision shows a positive sign it implies that on average earlier releases have been underestimated. Conversely a negative sign implies that on average earlier releases have been overestimated.

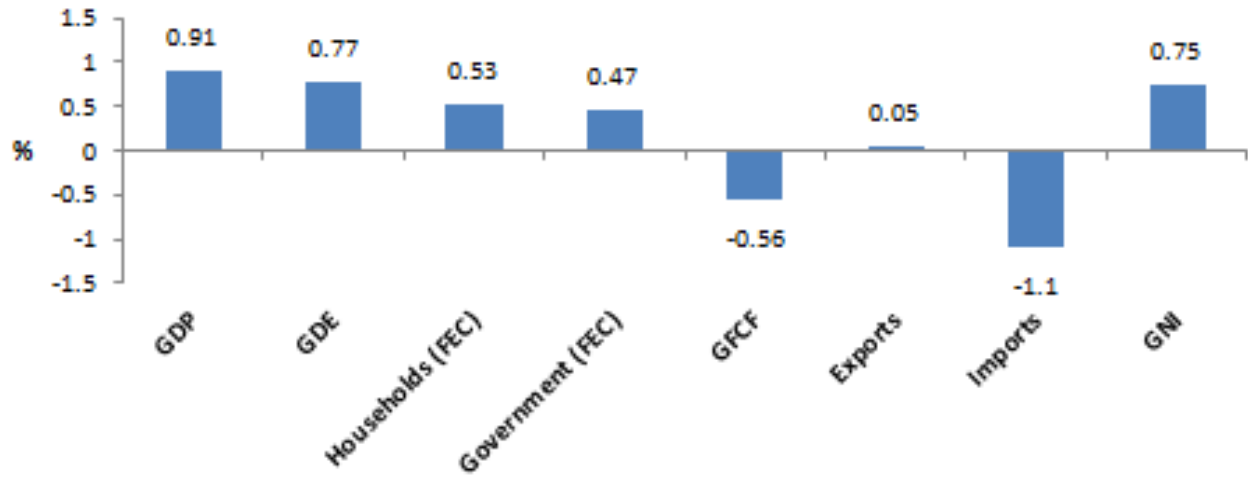


Figure-1. Mean revisions to South Africa's national accounts aggregates

Source: Author's own computation.

In Figure 1 the mean revisions (MR) to SA's national accounts aggregates for the period 1999Q1 to 2013Q4 are shown. On average earlier releases of GDP, GDE, FEC by households and government, exports and GNI have been underestimated. Whereas on average earlier releases of the GFCF and imports of goods and services have been overestimated.

6. Mean Absolute Revision

The mean absolute revision (MAR) is a useful measure to gauge the size of revisions because it avoids offsetting effects on the indicator from negative and positive revisions. Expressed in absolute percentage points indicates the average size of revisions.

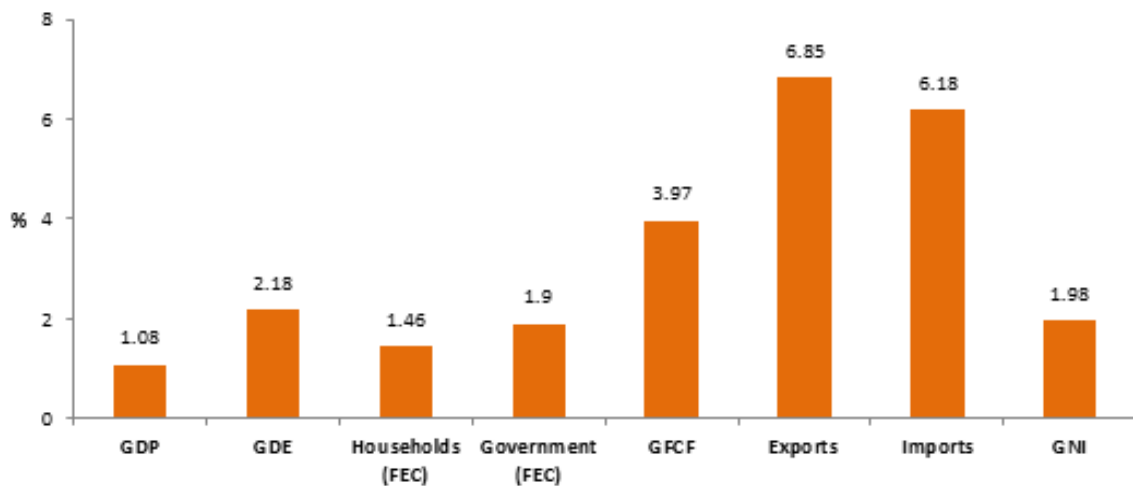


Figure-2. Mean absolute revisions to South Africa's national accounts aggregates

Source: Author's own computation.

7. Relative Mean Absolute Revision

The relative mean absolute revision is a useful measure of robustness of first published estimates as it can be interpreted as, the expected proportion of the first published estimate that is likely to be revised over the revision interval being considered.

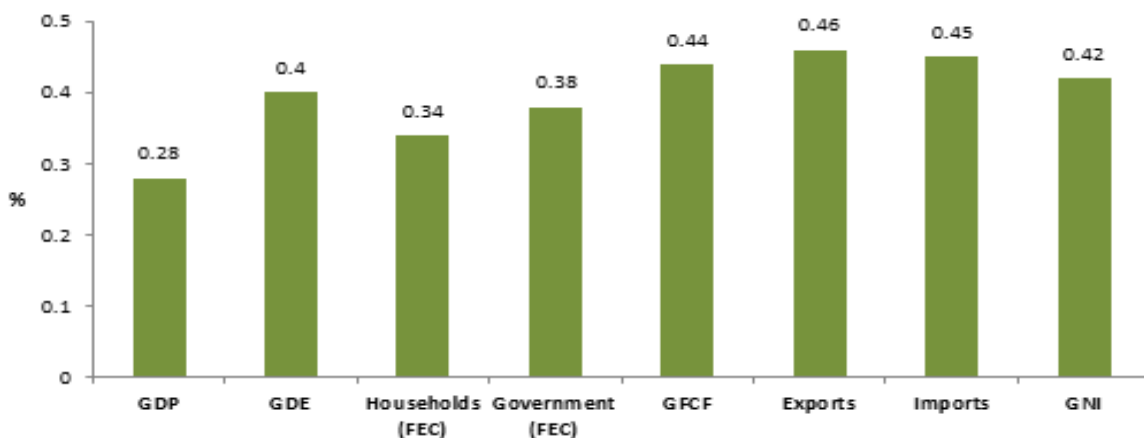


Figure-3. Relative mean absolute revisions South Africa's national accounts aggregates

Source: Author's own computation.

In Figure 3 the relative mean absolute revisions (RMAR) to SA's national accounts aggregates for the period 1999Q1 to 2013Q4 is shown. On average the RMAR for all the aggregates are not greater than 0.5 (50%).

8. Overestimations and Underestimations of GDP in South Africa

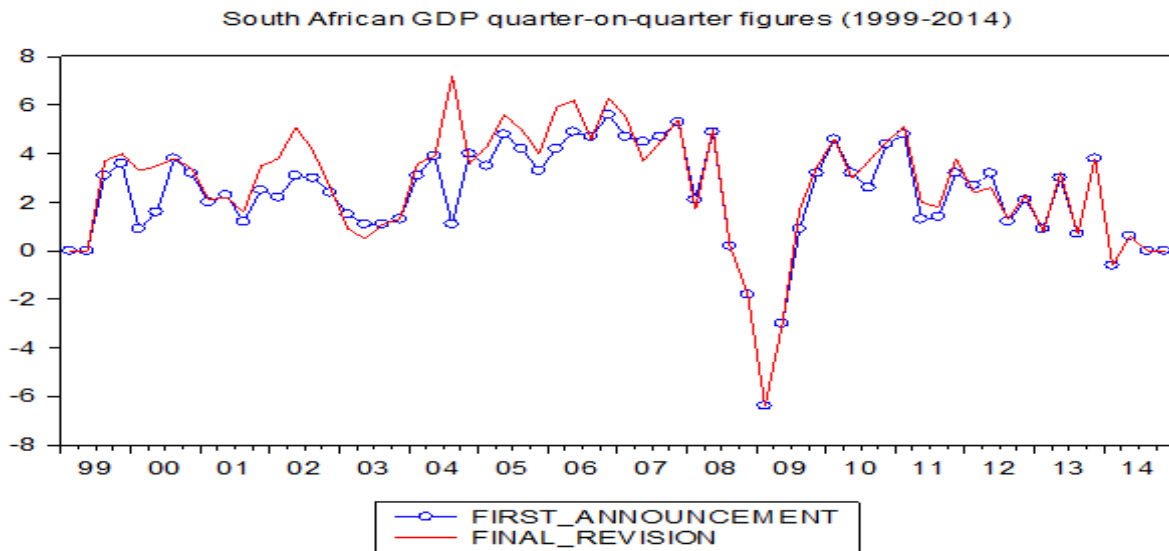


Figure-4. South African GDP quarter-on-quarter figures (1999-2014)

Source: Author’s own computation.

Figure 4 above shows four distinct periods of GDP underestimations and three periods of overestimations of GDP figures in South Africa. During the periods 1999 to 2000, 2001 to 2002, 2004 through to 2006 and 2010 to 2011 were periods in which South Africa underestimated its GDP figures. GDP figures were overestimated in 2003, 2007 and 2012. It is therefore important to examine whether these underestimations and overestimations were noise or news. We do this by use of a simple regression analysis using an ordinary least squares estimation technique.

9. Regression Analysis

Two of the most important seminal work in the literature that analyse the nature of revisions are Mankiw *et al.* (1984) and Mankiw and Shapiro (1986) where the authors analyse whether the preliminary announcements of GNP and money stock are rational forecasts of the true, or final announcements.

The study follows the model used by Sleeman (2005); Garratt and Vahey (2006) and McKenzie *et al.* (2008) in the following functional form:

$$\text{Final Revision}_t = \beta_0 + \beta_1 \text{First}_t + \varepsilon$$

Where:

Final Revision_t: is the difference between the final value and the first announced quarterly growth rate estimate.

β_0 : Constant

β_1 (First)_t: First denotes the first announcement of the quarterly GDP growth rate estimate.

ε : Error term

Under the news characterisation it is expected that the two parameters β_0 and β_1 be jointly equal to zero. In other words the two parameters will be jointly insignificant. Therefore the following hypothesis will be tested.

$$H_0: \beta_0 = \beta_1 = 0$$

$$H_1: \beta_0 \neq \beta_1 \neq 0$$

If the null hypothesis is rejected then it can be concluded that revisions are characterised by noise rather than news.

Table-1. Tests for news in revisions to SA’s national accounts aggregates at constant prices

Variable	Sample of quarters	α	β	Pr($\alpha = \beta = 0$)	Comment
Gross Domestic Product	1999Q1-2013Q4	0.556659 (0.21009)	-0.024387 (0.064581)	0.001772***	Reject H ₀
Gross Domestic Expenditure	1999Q1-2013Q4	0.731912 (0.311796)	-0.104991 (0.050692)	0.047129**	Reject H ₀
Final Expenditure Consumption by Households	1999Q1-2013Q4	0.570438 (0.204553)	-0.023906 (0.04782)	0.001574***	Reject H ₀
Final Expenditure Consumption by General Government	1999Q1-2013Q4	1.095227 (0.317256)	-0.184967 (0.052062)	0.001189***	Reject H ₀
Gross Fixed Capital Formation	1999Q1-2013Q4	-0.48309 (0.612061)	0.061514 (0.06903)	0.650645	Fail to reject H ₀
Exports of Goods and Services	1999Q1-2013Q4	1.341153 (1.112007)	-0.136958 (0.057824)	0.055988**	Reject H ₀
Imports of Goods and Services	1999Q1-2013Q4	0.239167 (0.754202)	-0.069628 (0.032594)	0.104023	Fail to reject H ₀
Gross National Income	1999Q1-2013Q4	0.514836 (0.279143)	-0.019272 (0.06207)	0.092309*	Reject H ₀

Level of significance: ***=1%, ** = 5%, *=10%

In Table 1 the results of the regression analysis testing for news in revisions to SA's national accounts aggregates for the period 1999Q1 to 2013Q4 are shown. The null hypothesis is rejected for the national aggregates variables: GDP, GDE, Final Consumption Expenditure by households and by general government. We fail to reject the null hypothesis for the national aggregates variables: Gross Fixed Capital Formation and Imports of goods and services.

10. Conclusions

All initially published estimates of GDP and its components are subject to revisions. Even though revisions in general aim to enhance the information available to users the change to initially published data may lead to adjustment measures being made to the assessment of the performance of the economy as each revision will cause users to revise existing interpretations of the course of the GDP indicator, and hence possibly change economic forecasts and policy implications. McKenzie (2007) explains that this may occur through a changed interpretation based on the revised data itself or the impact the revision may have on econometric models which may incorporate several statistics, each subject to revision. Major revisions in their nature have an extensive and larger effect. Their effects might even be disruptive, especially when they are associated with changes in statistical methods, concepts, definitions or classifications. In this case users may have to undertake extensive modifications of their databases or models. The regression analysis shows that revisions to the preliminary growth rate estimates for GDP, GDE, final consumption expenditure by households and general government are noise. The paper concludes that the preliminary estimates for GDP, GDE, final consumption expenditure by households and general government for the period 1999Q1 to 2013Q4 are not efficient. Therefore not too much confidence should be placed to interpretations of the course of the indicator and thus on the reliability of existing and future announcements of the variables. For short-term analysis users are recommended to focus for example on different measures and in the long-term make use of annual estimates of GDP, GDE, final consumption expenditure by households and general government national accounts aggregates.

To monitor and better understand the characteristics of the statistical compilation process, enabling potential problems to be identified and improvements to be made particularly to GDP, GDE, final consumption expenditure by households and general government national accounts aggregates, the statistical agencies Statistics South Africa and the South African Reserve Bank should conduct periodic analyses of revisions and to make them available to users.

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