



Annual analysis of revisions to monetary aggregates and effective interest rates data (2010-12)

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This article is the annual update of the analysis of revisions to monthly monetary aggregates and effective interest rates data produced by the Bank of England's Statistics and Regulatory Data Division (SRDD). Based on measures of revision size and bias, the results show that revisions can be considered immaterial for most series tested. This is the same broad conclusion as was reached in the 2014 analysis.

The Bank of England's Statistics and Regulatory Data Division has presented analysis of revisions to monthly monetary aggregates and effective interest rates on an annual basis since 2009. Revisions are examined on a rolling three-year window of published data after two years have elapsed. This article updates the analysis for 2010-12 data, covering broadly the same series as considered last year.

Key points

For monetary series data, the results are similar to last year's analysis for 2009-11 data, where revisions to series were found to be broadly immaterial.¹ This finding holds even though the introduction of certain one-off methodological improvements had minor impacts on some series over the period under review. These related to M4, M4 lending and their respective other financial corporations (OFC) components.² For effective rates data the results are also similar to last year's analysis, where revisions were found to be broadly immaterial.

¹ See 'Annual analysis of revisions to monetary aggregates and effective interest rates data (2009-11)' by Niamh Reynolds, Alistair Strathern and Denzel Walters, Bank of England *Bankstats (Monetary & Financial Statistics)*, May 2014, available at www.bankofengland.co.uk/statistics/Documents/ms/articles/art1may14.pdf.

² All M4 lending series investigated in this analysis refer to those series which have been relabelled as M4L 'historical measures' from May 2015. For further details, see 'Changes to the treatment of loan transfers and lending to housing associations' by Zeeshan Akhtar and Alistair Strathern, Bank of England *Bankstats (Monetary & Financial Statistics)*, April 2015, available at www.bankofengland.co.uk/statistics/Documents/ms/articles/art1apr15.pdf.

Revision size, bias and materiality

As in previous analyses, this article evaluates revisions according to measures of their size, tests for bias in revisions and measures of materiality. Methodology and results for this analysis are presented in full in Annexes A and B. Definitions for the series investigated can be found in Annex C.

For monetary series, both seasonally adjusted and non seasonally adjusted data are considered. In both cases, results are broadly similar to those found in the 2014 analysis. Mean revisions and mean absolute revisions are broadly unchanged overall (Annex B, Table 1). However, mean absolute revisions have fallen slightly for more than half of the seasonally adjusted series considered, compared to last year. For effective interest rates data, revisions are slightly larger than those observed in the 2014 analysis, although as in 2014 these can be considered broadly immaterial (Annex B, Table 2).

No material bias was found for any of the monetary aggregates series (Annex B, Table 3). This was also the case for effective rates series (Annex B, Table 4).

Even in the absence of bias, revisions could still be considered to be material. However, revisions to most series appear broadly immaterial (Annex B, Tables 5 and 6).

Illustrative examples

This section considers in more detail selected examples of series that demonstrate the largest revisions for the series considered in this analysis.

Chart A depicts revisions to the one-month growth rate in M4 lending to OFCs, non seasonally adjusted. Among the non seasonally adjusted data, this series had the highest mean absolute revision (0.66 percentage points), although no evidence of bias was detected for this series.

Chart A shows that revisions are generally larger before February 2012. This reflects the fact that methodological changes to the estimation of this series were implemented for February 2012 data and this impacted the estimation of data before this point. These changes consisted of improvements in the estimation of the effects of price movements in OFC securities held by MFIs, specifically to exclude MFIs' holdings of bonds issued by their own securitisation SPVs.³ Therefore, the size and materiality of revisions to this series should be seen as reflecting a one-off change in the measure's construction. This change is also the key driver of the revisions to the one-month growth rate of aggregate M4 lending (which show similar results in terms of materiality).

Chart B shows original and revised estimates for seasonally adjusted M4. In this case, the materiality of revisions can be attributed to a change in the seasonal adjustment methodology implemented in November 2013. This involved a change from temporary adjustment methods to standard methods for the OFC component of M4, which drove the materiality of revisions for both aggregate M4 and its OFC component.⁴ Moreover, combined with the change in estimation of MFIs' holdings of OFC securities, this helps explain the magnitude of the revisions to seasonally adjusted M4 Lending and its OFC component.

For effective interest rates, the series with the largest ratios of mean square revision to variance of

the underlying data (one measure of materiality used by the Bank) were time deposits from OFCs and other loans to OFCs (Annex B, Table 6). As discussed in last year's analysis, revisions to these series were due to a methodological change to exclude the reporting of effective rates for intra-group business.⁵ Revisions to other rates series were largely immaterial.

Chart A: Estimates of M4 lending to OFCs, one-month growth rates, non seasonally adjusted

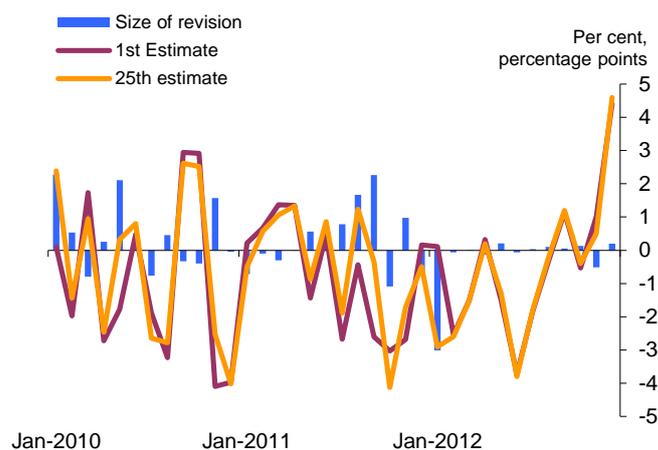
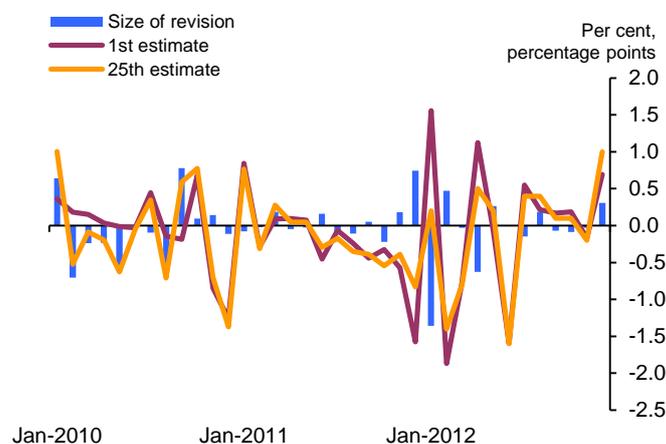


Chart B: Estimates of M4, one-month growth rates, seasonally adjusted



³ For further details on this change, see 'Estimations of securities transactions: a change in the methodology and its impact on M4Lx', by Tim McDonald, Bank of England *Bankstats (Monetary & Financial Statistics)*, February 2012, available at www.bankofengland.co.uk/statistics/Documents/ms/articles/art1feb12.pdf.

⁴ For further details, see 'Modifications to the seasonally adjusted measures of M4 and M4 lending excluding intermediate OFCs', by Rajveer Berar and Ross Meader, Bank of England *Bankstats (Monetary & Financial Statistics)*, October 2013, available at www.bankofengland.co.uk/statistics/Documents/ms/articles/art1oct13.pdf.

⁵ For further details, see 'Developments in effective and quoted rates statistics' by Kiman Bassi, Bank of England *Bankstats (Monetary & Financial Statistics)*, March 2011, available at: www.bankofengland.co.uk/statistics/Documents/ms/articles/art3mar11.pdf.

Annex A: Background

The Bank's *Statistical Code of Practice* commits SRDD to report regularly on data quality, including revisions.⁶ Alongside this commitment, SRDD has published a *Data Quality Framework* describing its approach to data quality issues, which features quantitative indicators of revisions.⁷

Lyon and Sansum (2009) presented the results of the first annual analysis under the *Data Quality Framework*, covering revisions to 2004-06 data on monthly monetary aggregates and monthly effective interest rates.⁸ This analysis has been updated on an annual basis since then. This article updates the analysis for 2010-12 data, covering broadly the same series as last year.⁹ Definitions for the analysed data series can be found in Annex C.

Revisions and data quality

Revisions reflect the reliability of the first published estimates of data series as indicators of later, or 'settled', estimates for the period in question. Given this, information on revisions represents one aspect of data quality, complementing other aspects, such as timeliness and consistency.

Revisions may reflect corrections to earlier information, or they may be the consequence of improved information superseding earlier estimates.

In particular, revisions to seasonally adjusted data can arise as a consequence of revisions to the underlying unadjusted data, the addition of the

⁶ See the Bank of England's 'Statistical Code of Practice', June 2013, available at www.bankofengland.co.uk/statistics/Documents/about/code.pdf.

⁷ See the Bank of England's 'Data Quality Framework', March 2014, available at www.bankofengland.co.uk/statistics/Pages/about/dqf.aspx.

⁸ See 'Analysis of revisions to monetary and effective interest rates data' by Michael Lyon and Gayle Sansum, Bank of England *Bankstats (Monetary & Financial Statistics)*, March 2009, available at:

www.bankofengland.co.uk/statistics/Documents/ms/articles/art1mar09.pdf.

⁹ The publication of the aggregate Divisia money series was ceased in December 2013 and so Household Divisia money is considered instead in this analysis (see 'Improvements to Divisia money series' by Rajveer Berar, Bank of England *Bankstats (Monetary & Financial Statistics)*, August 2013, available at www.bankofengland.co.uk/statistics/Documents/ms/articles/art1aug13.pdf). Lending to individuals (total) is omitted from this year's analysis as it should be sufficient to consider just its two constituent components, secured and unsecured lending. The Lending to individuals (secured) series now excludes lending to housing associations (see 'Changes to the treatment of loan transfers and lending to housing associations' by Zeeshan Akhtar and Alistair Strathern, Bank of England *Bankstats (Monetary & Financial Statistics)*, April 2015, available at www.bankofengland.co.uk/statistics/Documents/ms/articles/art1apr15.pdf).

latest observation to the series and changes to the seasonal adjustment process (including the re-estimation of seasonal and calendar factors). The annual assessment of seasonal adjustment settings (e.g. the parameters of the X-13ARIMA-SEATS model) can be another source of revision.¹⁰ As a result, revisions to seasonally adjusted data might naturally be expected to be initially larger, and to settle down later, than revisions to the non seasonally adjusted data. In this respect, some revisions are necessary and desirable to maintain the quality of seasonal adjustment and ensure that the seasonally adjusted data are free from residual seasonality and calendar effects.

Definitions and method

For an observation (data point) for a given reporting period, the revision is defined as the difference between the first estimate for the period and the estimate published 24 months later, with a positive sign meaning the later estimate is greater than the first estimate. For the monetary aggregates series, revisions are calculated with respect to their one-month growth rates¹¹; for mortgage approvals, they are calculated in terms of new monthly approvals for house purchase measured by number (000's) and total of all mortgage approvals by value (£mn); for net finance raised by private non-financial corporations (PNFCs) by value (£mn); and for effective interest rates, they are defined in terms of their actual levels (%).

The *Data Quality Framework* recommends using a standard sample of revisions covering three calendar years in the case of monthly data, i.e. 36 observations, and therefore requires a five-year span of available data (i.e. 36 + 24 months).¹² The results presented in this analysis relate to revisions to the first estimates produced for the reporting periods from January 2010 to December 2012, using information on revisions to estimates published up to December 2014.

¹⁰ For further details, see 'Seasonal adjustment: 2015 update' by Ross Meader, Bank of England *Bankstats (Monetary & Financial Statistics)*, May 2015, available at www.bankofengland.co.uk/statistics/Documents/ms/articles/art3may15.pdf.

¹¹ Growth rates of the monthly aggregates are as defined in the explanatory notes: 'Changes, flows, growth rates', at www.bankofengland.co.uk/statistics/Pages/iadb/notesiadb/Changes_flows_growth_rates.aspx.

¹² The headline M4 excluding intermediate other financial corporations (OFCs) series and M4 lending excluding intermediate OFCs series are not presented in this revisions analysis because the one-month growth rates for these measures were not published on a non seasonally adjusted basis until October 2010.

Annex B: Results

Revision size

Table 1 shows mean revisions, and means of revisions in absolute size, for the monthly monetary data. The latter can be interpreted as a measure of the average size of revision irrespective of sign. This table covers both non seasonally adjusted and seasonally adjusted data.¹³

Table 2 shows the same information for effective interest rates.

In the tables below, net finance raised by PNFCs corresponds to funds raised by PNFCs from monetary financial institutions and capital markets. There are no corresponding stocks series for this. Although it would be an inexact match to the flow definition, the mean total stock of monetary financial institutions' (MFI) lending to PNFCs could be used for an indicative order of magnitude scaling. On this basis, the mean revision and mean absolute revision to the one month growth rate of seasonally adjusted data would be of the order of 0.01% and 0.16%, respectively of this stock.

¹³ Note that this article reports on revisions to monthly data published at a monthly frequency, and does not readily extend to revisions of annual data, such as 12-month growth rates. Annual growth rates are determined as a compound of monthly rates so that revisions to such data will reflect different vintages of revised monthly data. Most revisions tend to occur within the first few months following initial release, so that revisions to annual growth rates will typically be mostly influenced by those to recent monthly data only.

Table 1: Revisions to monetary aggregates, non seasonally adjusted and seasonally adjusted data (one-month growth rate; or as stated)^(a)

Series	Non seasonally adjusted data		Seasonally adjusted data	
	Mean revision	Mean absolute revision	Mean revision	Mean absolute revision
Notes and coin	0.00	0.00	-0.03	0.19
Household Divisia money ^(b)	n.a.	n.a.	-0.07	0.16
M4	-0.02	0.08	-0.04	0.27
M4, retail	0.00	0.02	0.01	0.10
M4, wholesale	-0.05	0.18	-0.17	0.50
M4, households	0.01	0.03	0.02	0.05
M4, PNFCs	-0.01	0.17	-0.04	0.39
M4, OFCs	-0.06	0.21	-0.09	0.67
M4 lending	0.07	0.23	0.03	0.30
M4 lending to households	0.01	0.02	0.00	0.02
M4 lending to PNFCs	0.04	0.11	0.03	0.14
M4 lending to OFCs	0.16	0.66	0.07	0.85
Lending to individuals (secured)	0.01	0.02	0.00	0.02
Lending to individuals (unsecured)	0.04	0.09	0.04	0.10
Total value of all mortgage approvals, £mn	18 (0.2%)	25 (0.2%)	10 (0.1%)	186 (1.6%)
Number of mortgage approvals for house purchase, 000's	0.0 (0.0%)	0.1 (0.1%)	-0.1 (-0.1%)	0.7 (1.5%)
Net finance raised by PNFCs, £mn ^(c)	n.a.	n.a.	27	696

Definitions: see Annex C.

(a) Revisions calculated after two years to first estimates for the period 2010 to 2012. Net finance raised by PNFCs and total value of all mortgage approvals are reported as monthly flows, in £mn. Number of mortgage approvals for house purchase by number is reported in 000's. Figures in parentheses for certain series represent revisions expressed as a percentage of the mean of the revised published series over the period.

(b) Estimates for Household Divisia money were published as seasonally adjusted data only for the period covered.

(c) Estimates for net finance raised by PNFCs were published as seasonally adjusted data only for the period covered.

Summary of Table 1

The broad results from Table 1 with respect to non seasonally adjusted data are that:

- The largest mean revision to growth rates was for M4 lending to other financial corporations (OFCs) at 0.16 percentage points (pp). For all other growth rate series, mean revisions are no more than 0.07pp in either direction.
- Mean revisions to the approvals series considered (total value of all mortgage approvals and number of mortgage approvals for house purchase) were at or under $\pm 0.2\%$ of the originally reported figures. This was also the case for mean absolute revisions. For these series, both mean revisions and mean absolute revisions have decreased slightly compared to last year.
- The largest mean absolute revision to growth rates occurred with respect to M4 lending to OFCs (0.66pp). For all other growth rates, this is no more than 0.23pp.

Overall, these results are broadly similar to those found in the 2014 analysis.

With respect to the seasonally adjusted data:

- The largest mean revision to growth rate series is for wholesale M4 (-0.17pp). For all other growth rate series, mean revisions are no more than 0.09pp in either direction for all growth rate series.
- For these series, mean absolute revisions are largest with respect to M4 lending to OFCs (0.85pp).
- Mean absolute revisions have fallen slightly for more than half of the series tested, compared to last year.

Similarly to non seasonally adjusted data, the current results for seasonally adjusted series largely reflect the results of the previous report.

Table 2: Revisions to effective interest rates, by product and sector (annualised, percentage points)^(a)

Series	Mean revision	Mean absolute revision
<u>Rates on outstanding business</u>		
Interest bearing sight deposits, households	0.00	0.01
Time deposits, households	0.00	0.00
Loans secured on dwellings, households	0.01	0.01
Credit card loans, households	0.01	0.03
Other loans, households	0.07	0.09
Overdrafts, households	0.07	0.13
Interest bearing sight deposits, PNFCs	0.01	0.01
Time deposits, PNFCs	0.01	0.01
Overdrafts, PNFCs	0.03	0.03
Other loans, PNFCs	0.02	0.03
Interest bearing sight deposits, OFCs	0.02	0.02
Time deposits, OFCs	-0.19	0.24
Other loans, OFCs	0.07	0.09
<u>Rates on new business</u>		
Time deposits, households	0.01	0.01
Loans secured on dwellings, households	0.00	0.01
Other loans, households	0.07	0.08
Time deposits, PNFCs	0.00	0.01
Other loans, PNFCs	0.10	0.10

Definitions: see Annex C.

(a) Revisions calculated after two years to first estimates for the period January 2010 to December 2012.

Summary of Table 2

The results from Table 2 show revisions to effective interest rates data are slightly larger than those in the 2014 report, specifically:

- The largest mean revision and mean absolute revision occurred with respect to 'Time deposits, OFCs' (-0.19pp and 0.24pp, respectively), reflecting a methodological change on Form ER whereby intra-group business was excluded, causing downward revisions.¹⁴ This was identified in last year's report and also affected the series 'Other loans to OFCs'.
- Mean and mean absolute revisions for 'Overdrafts to households' (0.07pp and 0.13pp) and 'Other loans to PNFCs, new business' (both 0.10pp) occurred due to some reporting institutions implementing system changes. Revisions to 'Other loans to households' (0.07pp and 0.09pp) and 'Other loans to households, new business' (0.07pp and 0.08pp) result from small revisions by one reporting institution.
- All other mean revisions and mean absolute revisions were less than 0.05pp.

Bias of revisions

When interpreting data releases, users may want to assess whether there is a persistent direction of revisions, and hence whether the early estimates are biased upwards or downwards. This can be investigated by applying statistical tests to establish, at a certain level of significance, whether the mean revision is different from zero. If that is the case, it may be concluded that original estimates are subject to a systematic bias over the period in question.

Tables 3 and 4 show outcomes of the application of a t-test and a Newey-West test both based on a 95% confidence interval for each revisions series, and summary conclusions on the presence or absence of bias in each case.

Table 3 relates to the monetary aggregates, covering both non seasonally adjusted and seasonally adjusted data; and Table 4 relates to effective interest rates.

¹⁴ For further details see 'Developments in effective and quoted rates statistics' by Kiman Bassi, Bank of England *Bankstats (Monetary & Financial Statistics)*, March 2011, available at: www.bankofengland.co.uk/statistics/Documents/ms/articles/art3mar11.pdf.

Table 3: Evidence for bias in monetary aggregates, non seasonally adjusted and seasonally adjusted data (based on one-month growth rates)^(a)

Series	Non seasonally adjusted data			Seasonally adjusted data		
	Evidence for bias: t-test ^(b)	Evidence for bias: Newey-West test	Conclusion on bias	Evidence for bias: t-test ^(b)	Evidence for bias: Newey-West test	Conclusion on bias
Notes and coin	Yes	Yes	Bias: downwards revisions	No	No	Unbiased
Household Divisia money ^(c)	n.a.	n.a.	n.a.	No*	Yes	Inconclusive
M4	No	No	Unbiased	No	No	Unbiased
M4, retail	No*	No	Unbiased	No*	No	Unbiased
M4, wholesale	No	No	Unbiased	No	Yes	Inconclusive
M4, households	Yes	No	Inconclusive	No	No	Unbiased
M4, PNFCs	No	No	Unbiased	No*	No	Unbiased
M4, OFCs	No	No	Unbiased	No	No	Unbiased
M4 lending	No	No	Unbiased	No	No	Unbiased
M4 lending to households	No	No	Unbiased	No*	No	Unbiased
M4 lending to PNFCs	No	No	Unbiased	No	No	Unbiased
M4 lending to OFCs	No	No	Unbiased	No	No	Unbiased
Lending to individuals (secured)	No*	No	Unbiased	No*	No	Unbiased
Lending to individuals (unsecured)	No	No	Unbiased	No	No	Unbiased
Total value of all mortgage approvals, £mn	No*	No	Unbiased	No*	No	Unbiased
Number of mortgage approvals for house purchase, 000's	No*	No	Unbiased	No*	No	Unbiased
Net finance raised by PNFCs, £mn ^(d)	n.a.	n.a.	n.a.	No	No	Unbiased

Definitions: see Annex C.

(a) Tests are assessed using a 95% confidence interval. Revisions calculated after two years to first estimates for the period 2010 to 2012. Net finance raised by PNFCs and total value of all mortgage approvals by value are reported as monthly flows, in £mn. Number of mortgage approvals for house purchase by number is reported in 000's.

(b) Evidence of bias is judged by the t-test when there is no significant evidence of first order autocorrelation of revisions according to a chi-squared test. Where autocorrelation is significant, the reported outcome represents the result of the adjusted t-test and is indicated as (*).

(c) Estimates for Household Divisia money were published as seasonally adjusted data only for the period covered.

(d) Estimates for net finance raised by PNFCs were published as seasonally adjusted data only for the period covered.

Summary of Table 3

For the non seasonally adjusted monetary aggregates data, the key features are as follows:

- With the exception of notes and coin, there is no significant evidence from the t-test and Newey-West test statistics for statistically significant bias to the monetary aggregates data.
- Notes and coin data was found to have a downward bias. However, the mean revision and mean absolute revision are both 0.00pp to two decimal places and so any bias can be considered immaterial.
- Tests for bias in Household M4 were inconclusive. However, at 0.01pp, any bias is small and so may be considered immaterial.

These results are broadly similar to those found for non seasonally adjusted series in 2014, where no overall evidence of bias was found for any series. However, in the 2014 analysis, the tests for bias in M4 lending to PNFCs were inconclusive, while Household M4 was found to be unbiased.

For the seasonally adjusted data:

- There is no overall significant evidence of bias for any of the series. However, the tests were inconclusive for Household Divisia money and for wholesale M4. Last year, both these series were found to be unbiased.

Summary of Table 4

With the exception of the outstanding and new business series 'Other loans to households', there is no evidence of systematic bias in effective interest rates series.

Tests for bias in the outstanding series 'Time deposits, PNFCs', 'Interest bearing sight deposits, OFCs' and 'Time deposits, OFCs', were inconclusive as the t-test and Newey-West test showed different results. The mean revisions for these series are 0.01pp, 0.02pp and -0.19pp respectively (Table 2). Similarly, the results for the new business series 'Other loans to PNFCs' were inconclusive, with a mean revision of 0.10pp.

In comparison, the 2014 results showed no overall evidence of bias for any series, although tests for the new business series 'Other loans to households' and 'Other loans to PNFCs' were inconclusive.

Table 4: Evidence for bias in annualised effective interest rates data^(a)

Series	Evidence of bias: t-test ^(b)	Evidence of bias: Newey-West test	Conclusion on bias
<u>Rates on outstanding business</u>			
Interest bearing sight deposits, households	No*	No	Unbiased
Time deposits, households	No*	No	Unbiased
Loans secured on dwellings to households	No*	No	Unbiased
Credit card loans to households	No*	No	Unbiased
Other loans to households	Yes*	Yes	Bias: upwards revisions
Overdrafts to households	No*	No	Unbiased
Interest bearing sight deposits, PNFCs	No*	No	Unbiased
Time deposits, PNFCs	No*	Yes	Inconclusive
Overdrafts to PNFCs	No*	No	Unbiased
Other loans to PNFCs	No*	No	Unbiased
Interest bearing sight deposits, OFCs	No*	Yes	Inconclusive
Time deposits, OFCs	No*	Yes	Inconclusive
Other loans to OFCs	No*	No	Unbiased
<u>Rates on new business</u>			
Time deposits, households	No*	No	Unbiased
Loans secured on dwellings to households	No	No	Unbiased
Other loans to households	Yes*	Yes	Bias: upwards revisions
Time deposits, PNFCs	No	No	Unbiased
Other loans to PNFCs	No*	Yes	Inconclusive

Definitions: see Annex C.

(a) Tests are assessed using a 95% confidence interval. Revisions calculated after two years to first estimates for the period January 2010 to December 2012.

(b) Evidence of bias is judged by the t-test when there is no significant evidence of first order autocorrelation of revisions according to a chi-squared test. Where autocorrelation is significant, this is indicated as (*), and the reported outcome represents the adjusted t-test.

Materiality of revisions

As seen above, it is possible for revisions to a series to exhibit a statistically significant bias which might nonetheless be considered subjectively to be small. Conversely, mean revisions may not be significantly different from zero, but possess a large variance. From the user perspective, a statistically significant but small bias might be regarded as immaterial. We do not offer any formal statistical test to determine whether the overall magnitude of revisions can be classed as 'small' or otherwise: materiality as discussed here amounts to a subjective assessment of the magnitude of the sample revisions.

Table 5 and Charts C and D present a selection of measures designed to enable users to compare the magnitudes of revisions with those of the underlying data for monetary series. Table 6 shows the same for effective interest rates. Useful measures for considering materiality include the mean square revision (MSR), which combines the variance and squared mean of revisions, and the root mean square revision (RMSR), the square root of this term.¹⁵ These allow two comparative ratios to be defined:

- Ratio of RMSR to the mean of underlying (revised) data; and
- Ratio of MSR to variance of underlying (revised) data (a 'noise to signal' ratio).

These ratios provide a summary comparison between potential sources of uncertainty - i.e. both the average revision and the variability of the revisions - when interpreting a first estimate of a data point, and the variability of the underlying series. The way in which individual users interpret these ratios will depend upon their specific uses of the data. But the basic principle is that the smaller these ratios the greater the confidence the user can have in the inference that revised estimates do not change the user's understanding of the data based on original estimates.

For example, in our analysis an MSR to variance ratio that is smaller than one means that revisions have been less volatile than the growth profile shown in the underlying series. Therefore, revisions have not led to large changes in growth rates. As

the MSR is composed of the squared mean and the variance of the revisions, the squared mean acts as a penalty factor in the calculation: a higher mean, i.e. more bias, requires lower variance to keep the MSR to variance ratio under one.

The converse proposition is less conclusive, since high values for these ratios could arise from relatively large revisions, or alternatively, in situations in which the underlying data exhibit low growth rates or low variance.

¹⁵ Further information on definitions and advice on suitable measures of revisions can be found at www.oecd.org/std/oecdeurostatguidelinesonrevisionspolicyandanalysis.htm.

Table 5: Measures of root mean square revision and mean square revision for monetary aggregates, non seasonally adjusted and seasonally adjusted data^(a)

Series	Non seasonally adjusted data			Seasonally adjusted data		
	RMSR (pp, or as stated)	RMSR, ratio to mean revised data	MSR, ratio to variance of revised data	RMSR (pp, or as stated)	RMSR, ratio to mean revised data	MSR, ratio to variance of revised data
Notes and coin	0.00	0.01	0.00	0.35	0.95	1.14
Household Divisia money ^(b)	n.a.	n.a.	n.a.	0.21	0.85	0.24
M4	0.16	-1.21	0.09	0.41	-3.06	0.41
M4, retail	0.03	0.10	0.00	0.12	0.38	0.22
M4, wholesale	0.38	-0.48	0.06	0.66	-0.82	0.23
M4, households	0.04	0.13	0.01	0.07	0.25	0.13
M4, PNFCs	0.21	0.90	0.01	0.49	2.30	0.34
M4, OFCs	0.42	-0.53	0.06	1.02	-1.35	0.37
M4 lending (M4L)	0.35	-1.87	0.27	0.39	-2.02	0.35
M4L to households	0.03	0.42	0.13	0.03	0.44	0.22
M4L to PNFCs	0.14	-0.58	0.07	0.18	-0.74	0.33
M4L to OFCs	1.01	-1.90	0.25	1.13	-2.06	0.32
Lending to individuals (secured)	0.03	0.45	0.33	0.03	0.43	0.40
Lending to individuals (unsecured)	0.13	0.60	0.16	0.13	0.67	0.35
Total value of all mortgage approvals, £mn	59	0.01	0.00	235	0.02	0.11
Number of mortgage approvals for house purchase, 000's	0.19	0.00	0.00	1.0	0.02	0.11
Net finance raised by PNFCs, £mn ^(c)	n.a.	n.a.	n.a.	984	-1.07	0.24

Definitions: see Annex C.

(a) Revisions calculated after two years to first estimates for the period 2010 to 2012. Net finance raised by PNFCs and total value of all mortgage approvals are reported as monthly flows, in £mn. Number of mortgage approvals for house purchase is reported in 000's.

(b) Estimates for Household Divisia money were published as seasonally adjusted data only for the period covered.

(c) Estimates for net finance raised by PNFCs were published as seasonally adjusted data only for the period covered.

Summary of Table 5

Key results for the non seasonally adjusted series:

- For all the one-month growth rates, the RMSRs are no more than 0.42pp, apart from for M4 lending to OFCs, where it is 1.01pp.
- The ratio of RMSR to the mean of the underlying data is above one (in absolute terms) for three series. M4 lending to OFCs shows the highest absolute ratio (-1.90).
- In the case of the ratio of the MSR to the variance of the underlying data, all series have ratios below one.

For all series, the RMSR for the seasonally adjusted data is greater than or equal to the RMSR for the non seasonally adjusted data. Other key results include the following:

- The largest RMSR among the growth rates occurs with respect to M4 lending to OFCs (1.13pp).
- The largest ratio of RMSR to the mean of the underlying data occurs for M4 (-3.06). This ratio is also greater than one for five other series.
- The MSR to variance ratio is largest for notes and coin (1.14), but is no more than 0.41 for all other series.
- Several large values identified last year for the ratio of the RMSR to the underlying mean have now fallen to much lower levels. This is the case for non seasonally adjusted M4 lending to OFCs, as well as seasonally adjusted M4 and M4 lending and their respective OFC components. These changes reflect the fact that these series have greater means in absolute terms this year, compared to the period considered in last year's review. However, given that these ratios are still above one, revisions to these series could still be considered to be material.

Chart C: Revisions to monetary aggregates, non seasonally adjusted data, mean and RMS revisions as ratios to revised data

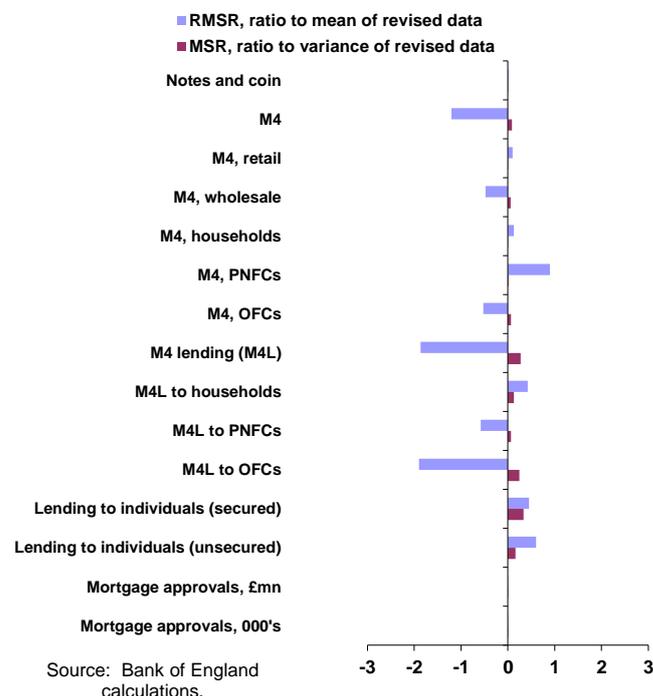


Chart D: Revisions to monetary aggregates, seasonally adjusted data, mean and RMS revisions as ratios to revised data

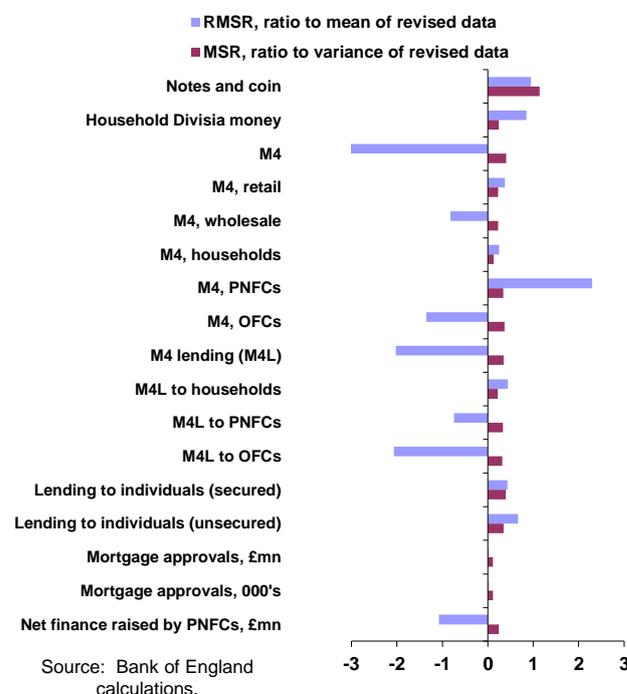


Table 6: Measures of root mean square revision and mean square revision, effective interest rates^(a)

Series	RMSR (pp)	RMSR, ratio to mean revised data	MSR, ratio to variance of revised data
<u>Rates on outstanding business</u>			
Interest bearing sight deposits, households	0.01	0.01	0.01
Time deposits, households	0.00	0.00	0.00
Loans secured on dwellings to households	0.02	0.00	0.02
Credit card loans to households	0.07	0.00	0.09
Other loans to households	0.12	0.02	0.19
Overdrafts to households	0.43	0.05	0.15
Interest bearing sight deposits, PNFCs	0.02	0.04	0.63
Time deposits, PNFCs	0.02	0.01	0.01
Overdrafts to PNFCs	0.08	0.02	0.06
Other loans to PNFCs	0.05	0.02	0.13
Interest bearing sight deposits, OFCs	0.03	0.04	0.05
Time deposits, OFCs	0.40	0.31	1.96
Other loans to OFCs	0.16	0.08	1.13
<u>Rates on new business</u>			
Time deposits, households	0.02	0.01	0.00
Loans secured on dwellings to households	0.02	0.00	0.01
Other loans to households	0.13	0.02	0.13
Time deposits, PNFCs	0.02	0.03	0.03
Other loans to PNFCs	0.15	0.06	0.30

Definitions: see Annex C.

(a) Revisions calculated after two years to first estimates for the period January 2010 to December 2012.

Summary of Table 6

The 2015 results show:

- The largest RMSR occurs with respect to 'Overdrafts to households' (0.43pp). The series 'Time deposits, OFCs' has a RMSR of 0.40pp and all other RMSRs are no more than 0.16pp. In comparison, the largest RMSR in the 2014 data was 0.41pp for the series 'Overdrafts to households'.
- All of the ratios of RMSR to the mean of the revised data are 0.08 or below, with the exception of 'Time deposits, OFCs' (0.31). These are broadly in line with the 2014 results.
- The series 'Time deposits, OFCs' has the largest ratio of the MSR to the variance of the revised data (1.96). This series was affected by a methodological change for January 2011 data onwards, therefore the revisions do not reflect initial systematic overestimation of the series.¹⁶ This methodological change also affected 'Other loans to OFCs' (1.13).
- Other series showing larger MSR to variance ratios are 'Interest bearing sight deposits, PNFCs' (0.63) and 'Other loans to PNFCs, new business' (0.30). The latter of these series was discussed in last year's analysis and was found to reflect one institution improving their reporting.

Any bias, discussed in previous sections in relation to the outstanding and new business series 'Other loans to households', could be considered immaterial as both the RMSR and MSR ratios are small.

¹⁶ For further details see 'Developments in effective and quoted rates statistics' by Kiman Bassi, Bank of England *Bankstats (Monetary & Financial Statistics)*, March 2011, available at: www.bankofengland.co.uk/statistics/Documents/ms/articles/art3_mar11.pdf.

Annex C: Definitions

Monetary series

Notes and coin – LPMVQVT (NSA), LPMVQUT (SA): Monthly 1 month growth rate of total sterling notes and coin in circulation outside the Bank of England (in percent).

Household Divisia money – LPMB6F7 (SA only): Monthly 1 month growth rate of monetary financial institutions' sterling divisia for household sector (in percent).

M4 – LPMVQKY (NSA), LPMVQJS (SA): Monthly 1 month growth rate of M4 (monetary financial institutions' sterling M4 liabilities to private sector) (in percent).

M4, retail – LPMVQXX (NSA), LPMVQWW (SA): Monthly 1 month growth rate of monetary financial institutions' sterling retail M4 liabilities to private sector (in percent).

M4, wholesale – LPMVRKC (NSA), LPMVRGU (SA): Monthly 1 month growth rate of monetary financial institutions' sterling wholesale M4 liabilities to private sector (in percent).

M4, households – LPMVVIL (NSA), LPMVVHT (SA): Monthly 1 month growth rate of monetary financial institutions' sterling M4 liabilities to household sector (in percent).

M4, PNFCs – LPMVVIF (NSA), LPMVVHN (SA): Monthly 1 month growth rate of monetary financial institutions' sterling M4 liabilities to private non-financial corporations (in percent).

M4, OFCs – LPMVVHZ (NSA), LPMVVHH (SA): Monthly 1 month growth rate of monetary financial institutions' sterling M4 liabilities to other financial corporations (in percent).

M4 lending (M4L) – LPMVQKW (NSA), LPMVQJQ (SA): Monthly 1 month growth rate of monetary financial institutions' sterling net lending (historical measure) to private sector (in percent).

M4L to households – LPMVVPL (NSA), LPMVVOR (SA): Monthly 1 month growth rate of monetary financial institutions' sterling net lending (historical measure) to household sector (in percent).

M4L to PNFCs – LPMVVPF (NSA), LPMVVOL (SA): Monthly 1 month growth rate of monetary financial

institutions' sterling net lending (historical measure) to private non-financial corporations (in percent).

M4L to OFCs – LPMVVOZ (NSA), LPMVVOF (SA): Monthly 1 month growth rate of monetary financial institutions' sterling net lending (historical measure) to other financial corporations (in percent).

Lending to individuals (secured) – LPMVTYD (NSA), LPMVTYF (SA): Monthly 1 month growth rate of total sterling net secured lending to individuals (in percent).

Lending to individuals (unsecured) – LPMVTYJ (NSA), LPMVTYL (SA): Monthly 1 month growth rate of total sterling net unsecured lending to individuals (in percent).

Net finance raised by PNFCs, £mn – LPMVYVV (SA only): Monthly amount of private non-financial corporations' sterling and all foreign currency funds raised from UK MFIs and capital markets (in sterling millions).

Total value of all mortgage approvals, £mn – LPMVTVN (NSA), LPMVTVQ (SA): Monthly value of total sterling approvals for secured lending to individuals (in sterling millions).

Number of mortgage approvals for house purchase, 000's – LPMVTVU (NSA), LPMVTVX (SA): Monthly number of total sterling approvals for house purchase to individuals.

Effective interest rates series (outstanding business)

Interest bearing sight deposits, households – CFMHSCV: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, interest bearing sight deposits from households (in percent).

Time deposits, households – CFMHSCW: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, time deposits from households (in percent).

Loans secured on dwellings to households – CFMHSDE: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, loans secured on dwellings to households (in percent).

Credit card loans to households – CFMHSDG: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, credit card loans to households (in percent).

Other loans to households – CFMHSDI: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, other loans to households (in percent).

Overdrafts to households – CFMHSDH: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, overdrafts to households (in percent).

Interest bearing sight deposits, PNFCs – CFMH SCT: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, interest bearing sight deposits from private non-financial corporations (in percent).

Time deposits, PNFCs – CFMH SCU: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, time deposits from private non-financial corporations (in percent).

Overdrafts to PNFCs – CFMH SDB: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, overdrafts to private non-financial corporations (in percent).

Other loans to PNFCs – CFMH SDC: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, other loans to private non-financial corporations (in percent).

Interest bearing sight deposits, OFCs – CFMH SCR: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, interest bearing sight deposits from other financial corporations (in percent).

Time deposits, OFCs – CFMH SCS: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, time deposits from other financial corporations (in percent).

Other loans to OFCs – CFMH SDA: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, other loans to other financial corporations (in percent).

Effective interest rates series (new business)

Time deposits, households – CFMB J74: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate - new time deposits from households (in percent).

Loans secured on dwellings to households – CFMB J95: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate, loans secured on dwellings, new advances to households (in percent).

Other loans to households – CFMB J93: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate - other loans, new advances to households (in percent).

Time deposits, PNFCs – CFMB J72: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate - new time deposits from private non-financial corporations (in percent).

Other loans to PNFCs – CFMB J82: Monthly average of UK resident monetary financial institutions' (excl. Central Bank) sterling weighted average interest rate - other loans, new advances to private non-financial corporations (in percent).