

Diagnostics for Benchmarking Economic Time Series at the U.S. Census Bureau

Irene Brown

U.S. Census Bureau, 4600 Silver Hill Road, Washington, DC 20233

Abstract

A common problem faced by government agencies that collect and publish time series data is to maintain a consistent set of time series. Benchmarking refers to methods used to adjust more frequent time series (e.g. monthly) to match the less frequent series (e.g. annual). Economic Programs at the U.S. Census Bureau recently began using new software to implement the Causey-Trager and Fagan benchmarking methods. Both methods use the iterative, nonlinear constrained optimization technique of steepest feasible descent to obtain a revised series. During parallel testing of thousands of revised series, the need for easy and effective diagnostics became apparent. The two software programs converged to the same solution, except for a small number of series. Further investigation showed that steepest feasible descent had sensitivity to numerical errors for these series. This paper investigates diagnostics, to help identify the types of series that need further review, through an empirical study. We examine graphical analysis suggested by Statistics Canada along with a few alternatives.

Keywords: Benchmarking, Time Series, Constrained Optimization, nonlinear programming

1. Introduction

The U.S. Census Bureau's Economic Programs provide statistics about U.S. businesses and government organizations. (<http://www.census.gov/econ/survey-freq.html>) These statistics are obtained from an Economic Census and Census of Governments every five years and from over 100 separate surveys taken monthly, quarterly, and annually, including thirteen principal economic indicators. The large number and different frequency of estimates balances the need for comprehensive, reliable, detailed statistics versus the need for timeliness. However, they create problems when trying to maintain consistent sets of time series for the same target population. The Economic Census and annual surveys provide the reliable detailed level estimates, where the monthly and quarterly surveys track the higher frequency period-to-period changes. Benchmarking combines the information from both surveys into a consistent higher frequency time series by preserving some characteristic of the original higher frequency series (e.g. the period-to-period changes) while attaining the levels of the less frequent series.

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The Census Bureau predominantly uses the Causey-Trager method to benchmark time series (Bozik 1988). The basic methodology has remained the same through several software implementations. Even Fagan's (1999) generalization to benchmark multiple breakouts of the same aggregate time series uses the same concepts developed in the early 1980s. During requirements gathering and parallel testing of the new software, the need for easy and effective diagnostics became apparent.

Consensus from the researchers, programmers, and analysts found the older ASCII files of data to be cumbersome and inefficient for reviewing large number of series. Graphical analysis was very helpful, but also inefficient and only used by a few of the surveys. This paper investigates diagnostics, to help identify the types of series that need further review and graphical analysis, through an empirical study. We examine concepts present in the graphical analysis suggested by Statistics Canada (Latendresse 2007) along with a few alternatives for growth rate (period-to-period changes) preservation.

2. Benchmarking Methods

The Causey-Trager (C-T) benchmarking method attempts to preserve the growth rates (period-to-period changes), while adjusting monthly or quarterly estimates to annual estimates and inter-censal annual figures to census figures. Define the higher frequency series as the original series and denote as:

$$x_t, t = 1, 2, \dots, n. \quad (1)$$

Define the less frequent series as the benchmarks and denote as:

$$T_k, k = 1, 2, \dots, m. \quad (2)$$

The indices t and k represent time periods that map to specific dates. Each benchmark covers a span of time periods from the original series, where b_k is the beginning time period for the k th benchmark and e_k is the ending time period for the k th benchmark such that

$$t = 1 \leq b_1 \leq e_1 < b_2 \leq e_2 < \dots < b_m \leq e_m \leq n$$

for $k = 1, 2, \dots, m$ non-overlapping benchmark periods. The C-T method finds a new series defined as the benchmarked/revised series and denote as:

$$y_t, t = 1, 2, \dots, n \quad (3)$$

Such that:

$$\sum_{t=b_k}^{e_k} y_t = T_k, k = 1, \dots, m, \quad (4)$$

while employing the iterative technique of steepest feasible descent to minimize the non-linear function referred to as the trend function

$$F_{trend} = \sum_{t=b_1}^{e_m-1} \left(\frac{y_{t+1}}{y_t} - \frac{x_{t+1}}{x_t} \right)^2. \quad (5)$$

The starting point for the iterative procedure comes from minimizing the proportionate first differences function proposed by Denton (1971) and referred to as the relative function

$$F_{relative} = \sum_{t=b_1}^{e_m-1} \left(\frac{y_{t+1}}{x_{t+1}} - \frac{y_t}{x_t} \right)^2. \quad (6)$$

The solution is the same as the modified Denton described by Dagum and Cholette (2006). For time periods before and after the benchmarks (i.e. $t < b_1$ and $t > e_m$), carry backward and carry forward factors are used. The carry backward factor is calculated and applied as

$$y_t = x_t * \frac{y_{b_1}}{x_{b_1}}, \text{ for } t = 1, \dots, b_1 - 1 \quad (7)$$

and the carry forward factor is calculated and applied as

$$y_t = x_t * \frac{y_{e_m}}{x_{e_m}}, \text{ for } t = e_m + 1, \dots, n \quad (8)$$

Both software programs round the revised series based on an algorithm so that the benchmark constraints (4) are still met. The Fortran always rounds to the nearest integer, where the new SAS software rounds to a user-defined level (default being the nearest integer). The rounded to the nearest integer revised series will be referred to and denoted as

$$\tilde{y}_t, t = 1, \dots, n$$

to distinguish it from the unrounded series of (3). A more detailed description of the newest software solutions and results are found in the Federal Committee on Statistical Methodology 2012 Research Conference paper “Modernization of Benchmarking Economic Time Series at the U.S. Census Bureau.” (Brown 2012)

3. Diagnostics

The new software implementation submits groups of series at a time and produces a summary dataset of important information for all the series in the group. The information collected includes the original and revised series names, which revision was used (relative or trend), the value of the objective function, the number of iterations, the carry backward and forward factors, the time span of the revision, and a warning flag indicating why results may not have been created. Most of the warning flags involve incorrect inputs that cause the programs not to run. The two exceptions occur when the programs run but the results need further review due to the algorithm stopping prematurely due to either reaching the maximum number of iterations or encountering an increase in the value of the objective function.

However, the new software still only produces an ASCII output file for each individual series for the diagnostics. The output from benchmarking Denton’s (1971) illustrative example using the trend revision is found in the Appendix. Most of the data found in this file can be visualized in three graphs commonly used by Statistics Canada. The first shows the basic differences between the original and revised series (See Figure 1) by plotting the original ($x_t, t = 1, \dots, n$) and revised ($\tilde{y}_t, t = 1, \dots, n$) series along with the average benchmarks calculated as

$$\frac{T_k}{e_k - b_k + 1}, \text{ for } t \in [b_k, e_k], k = 1, \dots, m.$$

In addition, the average original totals calculated as

$$\frac{\sum_{t=b_k}^{e_k} x_t}{e_k - b_k + 1}, \text{ for } t \in [b_k, e_k], k = 1, \dots, m$$

across the higher frequency time periods. Any major outliers in the series or benchmarks may be easily spotted with this graph.

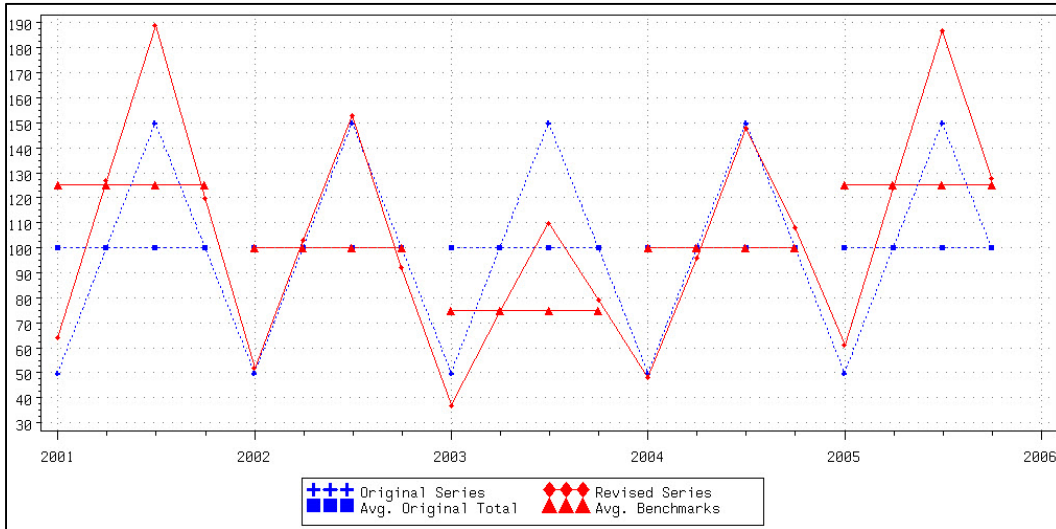


Figure 1: Denton Series Benchmarked using the Causey-Trager Trend Method

The next graph (see Figure 2) plots the revised-to-original ratio series calculated as

$$ro_t = \frac{\tilde{y}_t}{x_t}, t = 1, \dots, n,$$

along with the benchmark-to-original ratios calculated as

$$r_t = \begin{cases} r_k = \frac{T_k}{\sum_{t=b_k}^{e_k} x_t}, t \in [b_k, e_k], k = 1, \dots, m \\ \text{missing if } t \notin [b_k, e_k], k = 1, \dots, m \end{cases}$$

in addition, the bias calculated as

$$bias = \frac{\sum_{k=1}^m r_k}{m}.$$

Generally, large or small ratios are undesirable, but the bigger problem lies in large jumps between ratios. For example, when comparing the old software to the new software the revised series differed more when large jumps in the benchmark-to-original ratios occurred. (Brown 2012)

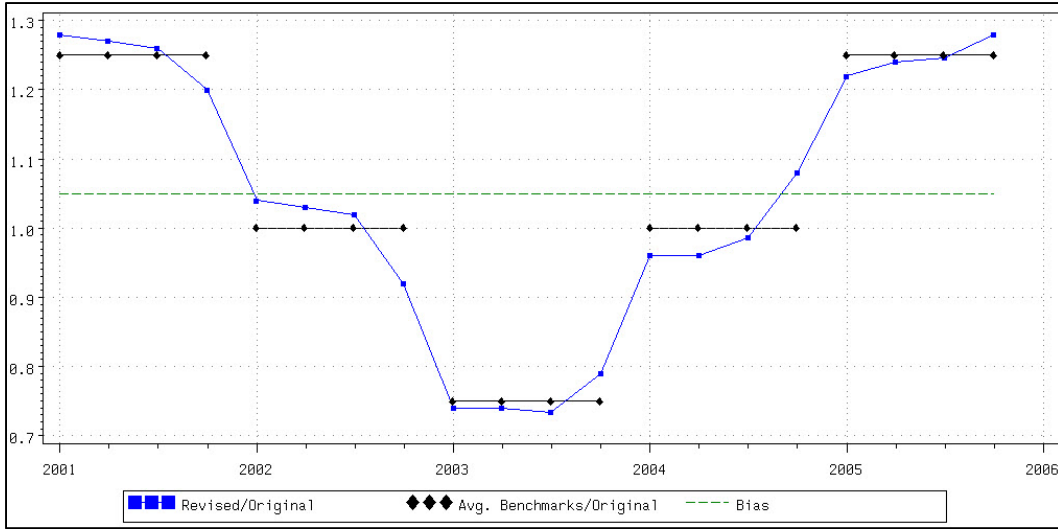


Figure 2: Revised-to-Original Ratio Graph of Denton Series (C-T Method)

The last graph (see Figure 3) shows the prior period growth rates (period-to-period changes) for the original series calculated as

$$pp_o_t = 100 * \left(\frac{x_t}{x_{t-1}} - 1 \right), t = 2, \dots, n$$

And the revised series calculated as

$$pp_r_t = 100 * \left(\frac{\tilde{y}_t}{\tilde{y}_{t-1}} - 1 \right), t = 2, \dots, n$$

Although this graph can show direction changes and the relative magnitude of the growth rate revisions, there may be more efficient ways to summarize the information.

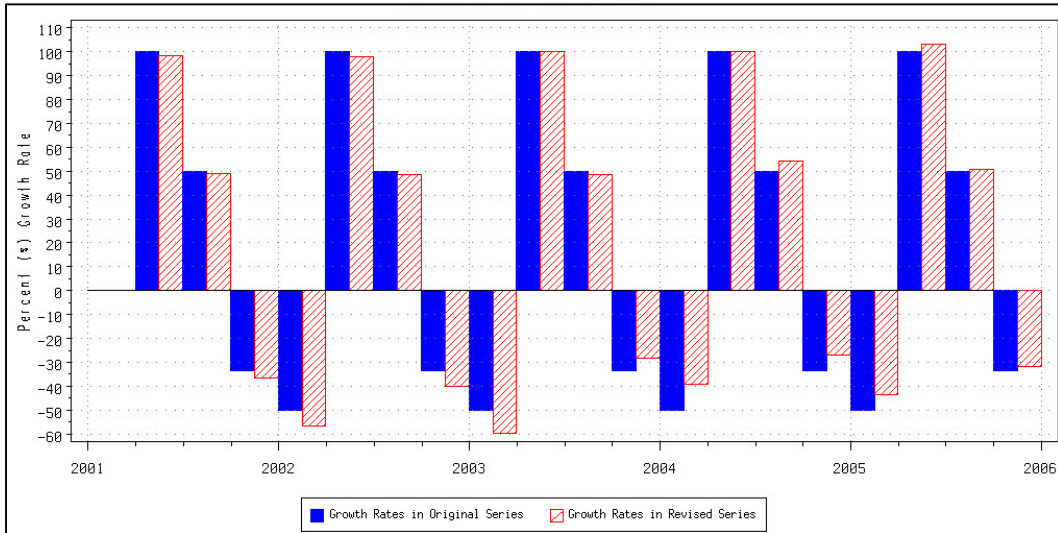


Figure 3: Growth Rates for the Denton Series (C-T Method)

Generally, with large sets of times series, looking at each output file and set of graphs per series may not be feasible. I propose six diagnostics to calculate per series with the primary goal of picking a smaller set of series that need closer inspection by analysts. The

secondary goal is to compare different methods. Often when the trend revision solution is found to have problems the default is to use the relative revision instead.

1. Bias - Calculated as above for the revised-to-original graphs.

$$bias = \frac{\sum_{k=1}^m (r_k)}{m}$$

where $r_k = \frac{T_k}{\sum_{t=b_k}^{e_k} x_t}$. This measurement is the same for all benchmarking methods.

This is one summary of the relationship between the benchmarks and original series.

2. The standard deviation of the bias - calculated as

$$std_bias = \sqrt{\frac{\sum_{k=1}^m (r_k - bias)^2}{m}}$$

Often, the variability in the bias creates more problems in the revised series than a larger bias.

3. Root Mean Square Percent Difference (RMSPD) – measures how close the level estimates of the revised estimates are to the original series and is calculated as

$$RMSPD = 100 * \sqrt{\frac{1}{n} \sum_{t=1}^n \left(\frac{\tilde{y}_t}{x_t} - 1 \right)^2}$$

This is a slight modification (using rounded values) to the Mean Squared Percent Adjustment (MSPA) proposed by Di Fonzo and Marini (2009). Also, associated with this measure would be the Mean Absolute Difference calculated as:

$$MAD = \frac{1}{n} \sum_{t=1}^n |\tilde{y}_t - x_t|$$

This helps to eliminate small valued series that may have large percent difference. For example, the difference between 1 and 2 is 50% and would not be as big as a 50% difference that is between 10,000 and 20,000.

4. Root Mean Square Revisions to the Growth Rates – measures how close the revised series period-to-period changes are to the original series and is calculated as

$$RMSR = 100 * \sqrt{\frac{1}{n-1} \sum_{t=1}^{n-1} \left(\frac{\tilde{y}_{t+1} - x_{t+1}}{\tilde{y}_t - x_t} \right)^2}$$

This standardizes the value of the trend objective function for different number of time periods in a given revision span.

5. Standard Deviation of Percent Change in Proportional Movement – another index proposed by Di Fonzo and Marini (2009) measures the variation in the

proportional movement (which the relative revision objective function minimizes) and is calculated as

$$SDPCPM = 100 * \sqrt{\frac{1}{n-1} \sum_{t=1}^{n-1} \left[\left(\frac{\tilde{y}_{t+1}}{x_{t+1}} - \frac{\tilde{y}_t}{x_t} \right) - \left(\frac{1}{n-1} \sum_{t=1}^{n-1} \left(\frac{\tilde{y}_{t+1}}{x_{t+1}} - \frac{\tilde{y}_t}{x_t} \right) \right) \right]^2}.$$

It is widely believed that large variations in the proportional movement result in large growth rate (period-to-period) changes from the original to revised series.

6. Percentage of Direction Changes in the Growth Rates – measures the percentage of time periods that the growth rate (period-to-period) direction changes in a revised series. For example, where the original series growth rate is positive and revised series growth rate is negative (or vice versa).

$$dc = 100 * \frac{\sum I_{dc}}{n},$$

where $I_{dc} = \begin{cases} 1 & \text{if direction change} \\ 0 & \text{if not direction change} \end{cases}$

Yet, not all direction changes are of concern. Those associated with small growth rates (e.g. 0.01% to -0.01%) are often not significantly different from zero. Therefore, the maximum of original and revised growth rates of the time periods where direction changes happen for each series were calculated.

Table 1 shows these summary diagnostics for Denton's example series for the pro-rating, relative, and trend benchmarking methods. The bias and the standard deviation of the bias are equal for all three methods because it is not dependent on the benchmarking method. Most diagnostics performed as expected for the three methods. One surprise was that the pro-rating method was closer to the original data series (RMSPD) than the other two, although all methods were very close to the same number.

Table 1: Proposed Diagnostics for the Denton Series by Benchmarking Method

Method	Bias	Standard Deviation of Bias	RMSPD (%)	SDPCPM (%)	RMSR (%)	DC (%)
Pro-Rating	1.05	0.02	19.36	11.77	6.03	0.00
Relative (Denton)			19.91	6.65	9.07	0.00
Trend (C-T)			19.67	8.65	4.92	0.00

4. Empirical Study

To summarize the proposed diagnostics, economic time series from the construction, manufacturing, retail, wholesale, and services industries currently benchmarked at the U.S. Census Bureau were used. Table 2 is a summary of the series by frequency and survey, along with the annual benchmark report year(s) for the series used. For some of the surveys all the series that are benchmarked were used and for others samples from the different years were used. Although, there is a good representation of the types of series benchmarked.

Table 2: Summary of Economic Time Series Used in Study

Frequency	Survey	Years	Number of Series
Monthly	Value of Construction Put in Place (VIP)	2005-2009	20
	Manufacturers' Shipments, Inventories, and Orders (M3)	2011	288
	Monthly Retail Trade and Food Services (MRTS)	2009,2011	170
	Monthly Wholesale Trade (MWTS)	2009,2011	166
Quarterly	Quarterly Retail E-Commerce Sales (QEC)	2008	14
	Quarterly Services Survey (QSS)	2008	39
Annual	Annual Retail Trade Survey (ARTS)	2004,2010	486
	Annual Wholesale Trade Survey (AWTS)	2004,2008,2010	672
	Service Annual Survey (SAS)	2007,2010	378

Figure 4 shows boxplots of the Bias by survey. Most of the surveys appear to have bias centered near one except for the Quarterly E-Commerce and VIP surveys. A number of the series in these two series have larger values for the benchmarks compared with the original series. A bias far from one does not always mean problems will occur in the revised series.

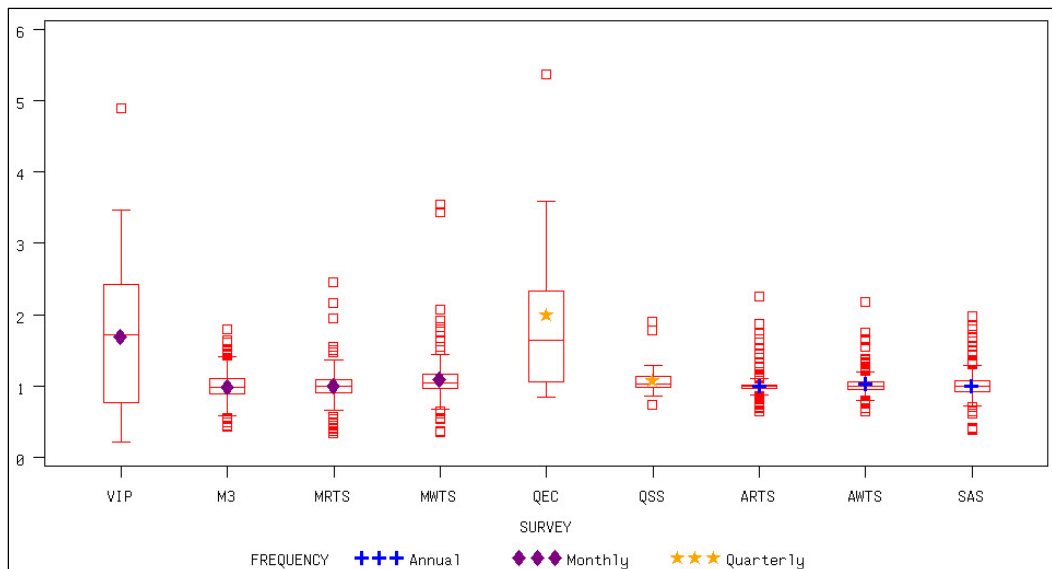


Figure 4: Boxplots of Bias by Survey

When comparing the revised series from the different software programs differences occurred more often when the bias had high variability (Brown 2012). For example, the VIP series tend to have few problems even though the bias was large because the variability is smaller. Figure 5 shows the boxplots of the standard deviation of the bias by survey. The Quarterly E-Commerce has large variability in the bias and the revised series tend to have more problems along with a few of the annual series.

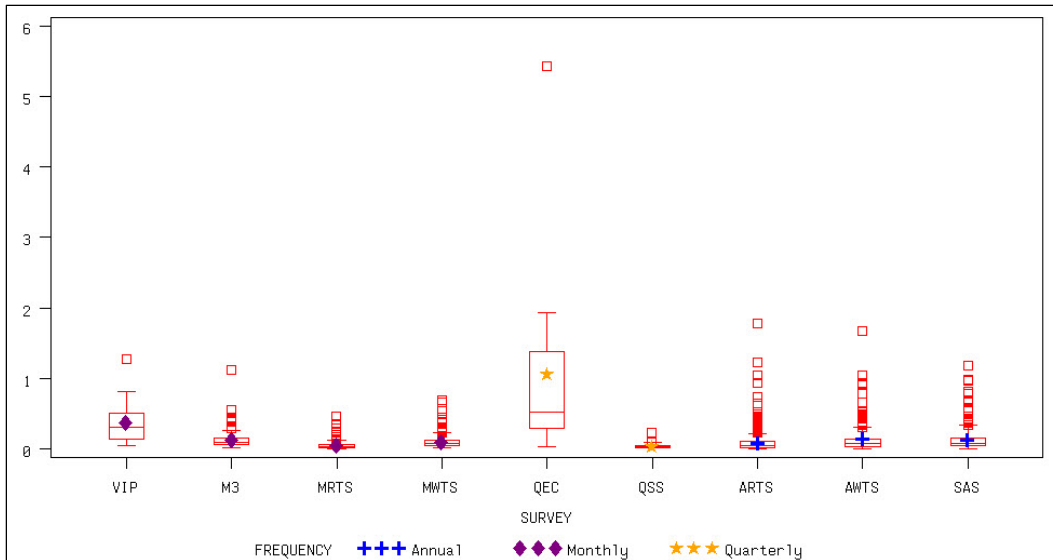


Figure 5: Boxplots of Standard Deviation of Bias by Survey

Figure 6 shows the boxplots of the RMSPD for the trend revision by survey. The pattern is very similar to the bias, which makes sense given that they both show the difference between the revised and original series (just at different frequencies). Although, in this case all the outliers appear on one side (due to the nature of diagnostic) thus showing that the VIP survey has the largest percent differences between revised and original series on average.

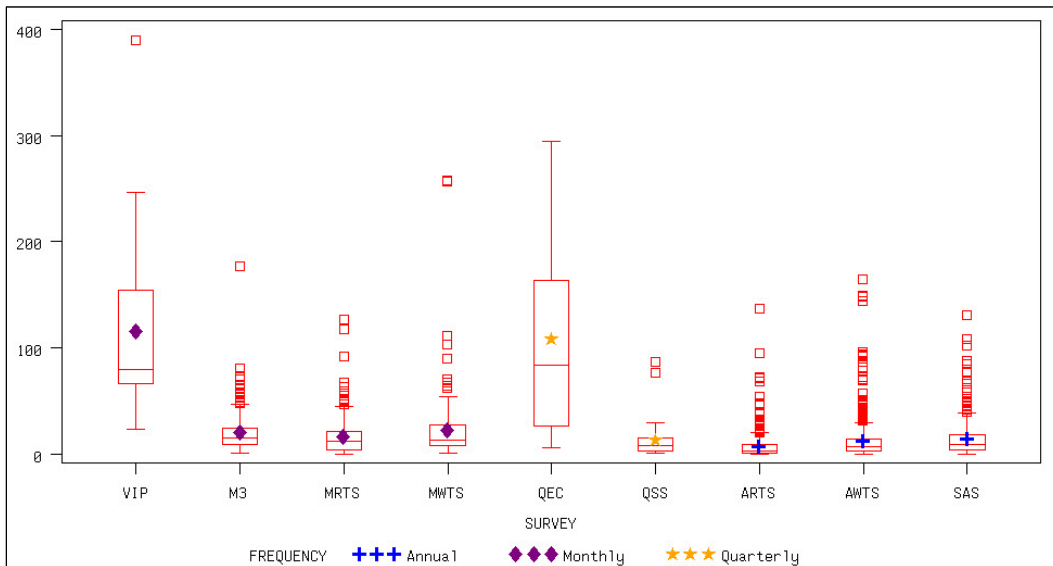


Figure 6: Boxplots of RMSPD for Trend Revision by Survey

When comparing the relative and trend revision by RMSPD neither method was clearly better than the other was across all surveys (See Table 3). For, a few annual and monthly stock (inventories) retail series, the rounded series were exactly equal. This was expected due to the two types of benchmarking methods being compared, since one is the starting point for the other.

Table 3: Percentage of Series picked “Best” by RMSPD Diagnostic

Frequency	Survey	Relative	Trend	Equal
Monthly	VIP	60.00	40.00	0.00
	M3	47.57	52.43	0.00
	MRTS	30.59	60.59	8.82
	MWTS	39.76	60.24	0.00
Quarterly	QEC	28.57	71.43	0.00
	QSS	48.72	51.28	0.00
Annual	ARTS	53.09	33.33	13.58
	AWTS	40.63	58.18	1.19
	SAS	53.44	43.39	3.17

Figure 7 shows the boxplots of the RMSR diagnostics for the trend revision. The quarterly E-Commerce series, as expected, have larger RMSR values. Interestingly, the annual series had highly right skewed distributions. Upon further investigation, most of the series with a really larger RMSR diagnostic also have large original growth rates (See Figure 8). As expected, when comparing the benchmarking methods with the RMSR diagnostic the trend revision is overwhelming picked to be better (See Table 4).

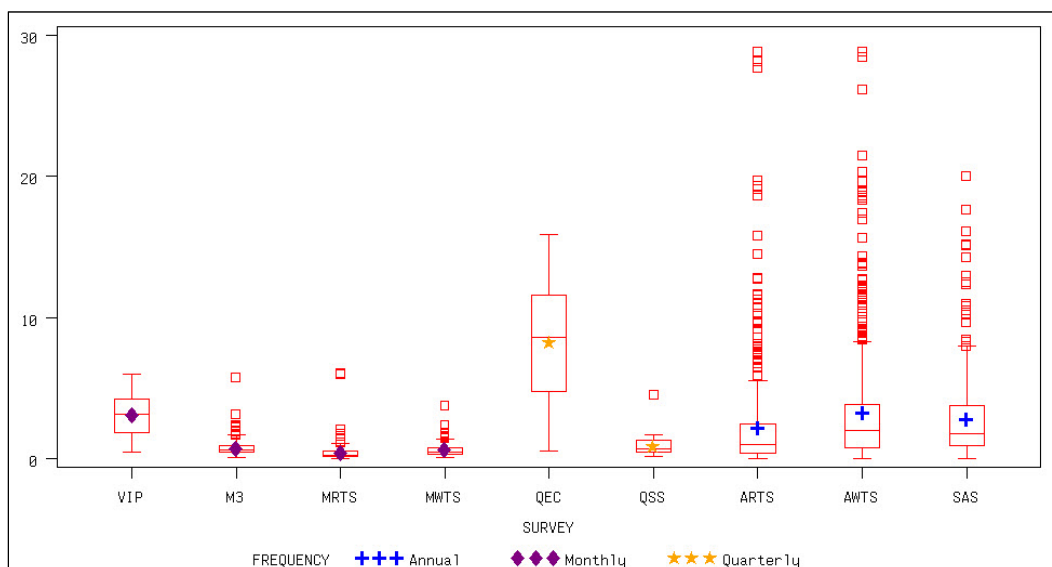


Figure 7: Boxplots of RMSR for Trend Revision by Survey

Table 4: Percentage of Series picked “Best” by RMSR Diagnostic

Frequency	Survey	Relative	Trend	Equal
Monthly	VIP	5.00	95.00	0.00
	M3	0.00	100.00	0.00
	MRTS	4.12	87.06	8.82
	MWTS	0.00	100.00	0.00
Quarterly	QEC	0.00	100.00	0.00
	QSS	0.00	100.00	0.00
Annual	ARTS	5.35	81.07	13.58
	AWTS	0.60	98.21	1.19
	SAS	0.53	96.30	3.17

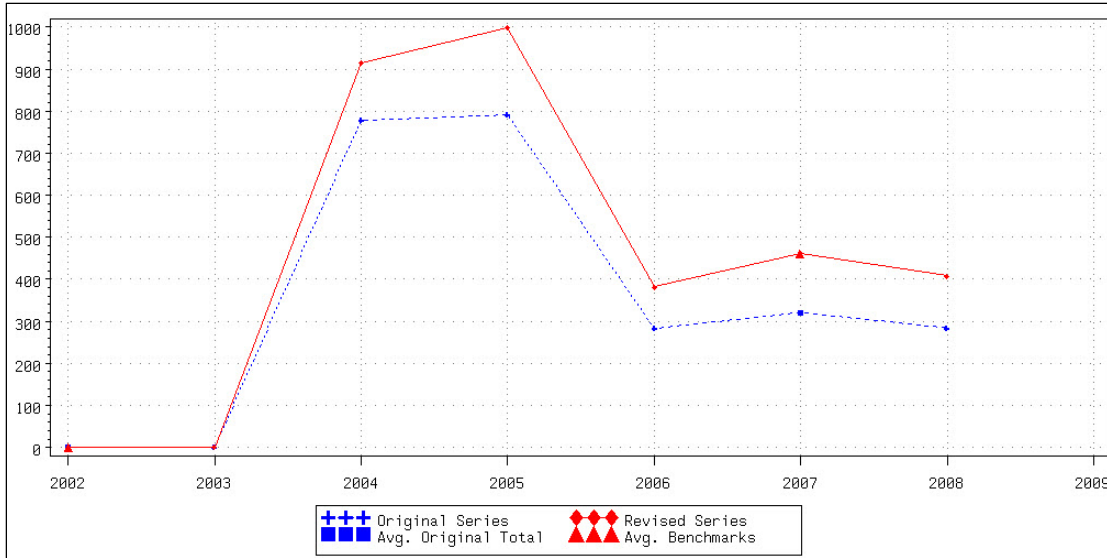


Figure 8: Original and Revised Series of an Annual Series with Large RMSR

Figure 9 shows the boxplots for the SDPCPM diagnostic for the trend revision. The distributions appear to be similar to the RMSR diagnostic, which suggests there is a relationship between the two measures. Although, there are a few differences that are hard to ignore like the outlier found in the quarterly E-Commerce series.

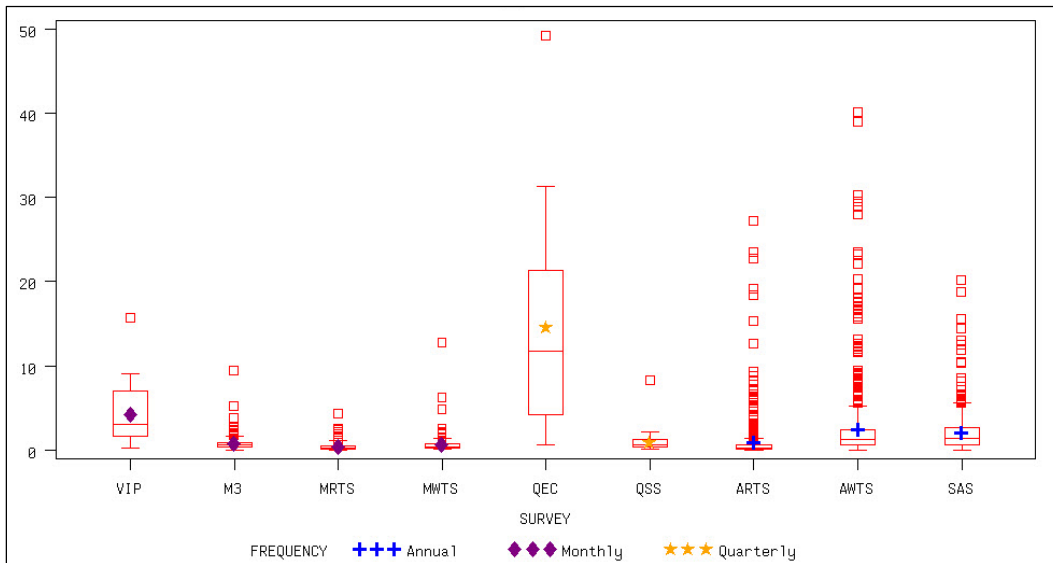


Figure 9: Boxplots of SDPCPM Trend for Revision by Survey

When comparing the benchmarking methods with the SDPCPM diagnostic the relative revision is overwhelmingly picked to be better (See Table 5). This is opposite of the RMSR diagnostic. In fact, we would expect the percentages to be exactly opposite but due to rounding the final revised series produce differences from the unrounded revised series. Although, the rounded revised series that are equal for both methods are still equal as for all the other diagnostics.

Table 5: Percentage of Series picked “Best” by SDPCPM Diagnostic

Frequency	Survey	Relative	Trend	Equal
Monthly	VIP	100.00	0.00	0.00
	M3	100.00	0.00	0.00
	MRTS	83.53	7.65	8.82
	MWTS	99.40	0.60	0.00
Quarterly	QEC	100.00	0.00	0.00
	QSS	92.31	7.69	0.00
Annual	ARTS	82.10	4.12	13.58
	AWTS	98.51	0.30	1.19
	SAS	96.56	0.26	3.17

Table 6 summarizes the percentage of direction changes found between the original and revised series by survey. For a number of surveys, the percentage of series with at least one direction change is much higher than previously thought. For a number of them this is because the original growth rate was very close to zero and there even a small revision would make it change direction. The analysts generally are not concerned about these types of direction changes.

Table 6: Summary of Percentage of Direction Changes Diagnostics

Frequency	Survey	% of Series with At Least One Direction Change	Average % of Direction Changes	Average Maximum Absolute Original Growth Rate
Monthly	VIP	85.00	7.23	4.51
	M3	90.27	4.63	1.05
	MRTS	40.00	1.11	0.51
	MWTS	68.07	3.17	0.87
Quarterly	QEC	92.85	7.53	10.19
	QSS	58.97	4.50	1.11
Annual	ARTS	25.51	5.23	2.42
	AWTS	37.35	6.44	3.74
	SAS	38.10	5.58	3.73

Table 7: Percentage of Series picked “Best” by Direction Change Diagnostic

Frequency	Survey	Relative	Trend	Equal
Monthly	VIP	15.00	20.00	65.00
	M3	5.90	10.42	83.68
	MRTS	2.94	9.41	87.65
	MWTS	8.43	3.61	87.95
Quarterly	QEC	21.43	35.71	42.86
	QSS	0.00	2.56	97.44
Annual	ARTS	2.47	2.06	95.47
	AWTS	4.61	2.53	92.86
	SAS	3.70	2.38	93.92

For a number of very volatile series though the direction changes were of concern but neither method appeared to be better. In fact, the benchmarking method seemed to have little effect on the number of direction changes with a large percentage being equal (see

Table 7). This would suggest the characteristics of the original series and the relationship with the benchmarks play a much bigger role in the type and magnitude of direction changes.

5. Conclusion

For large sets of time series, it is difficult to review individual revised series by text and graphical analysis. I proposed several diagnostics to identify the top problem series. The bias, standard deviation of the bias, and the root mean square percent difference (RMSPD) can help identify those series where the benchmarks differ the most from the original series and are volatile. This can lead to further review of the inputs to make sure they are correct with no errors. Depending on which movement preservation is most important, proportional or growth rate, the two competing diagnostics of SDPCPM and RMSR can be compared. Although large values for both diagnostics would generally pick the same series.

The empirical study suggested that the number and size of direction changes in the revised series were less likely to be due to the benchmarking method as to the relationship between the benchmarks and original series. It also appears that a number of problem series could be identified before benchmarking by looking at the volatility of the growth rates in the original series and the movement of the benchmark to original ratios. Further analysis with a simulation study that has known problem series would help identify which diagnostics do the best job in identifying those series.

Acknowledgements

The author would like to thank Xijian Liu, David Kinyon, and Deanna Weidenhamer for careful reviews of earlier drafts of this paper.

All graphs and analysis were produced and preformed using SAS® 9.1.3.

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References

- Bozik, J.E. and M.C. Otto (1988), “Benchmarking: Evaluating Methods that Preserve Month-to-Month Changes.” Statistical Research Report Series 88/07, U.S. Census Bureau: Washington, DC. www.census.gov/srd/papers/pdf/rr88-07.pdf.
- Brown, I. (2012), “Modernization of Benchmarking Economic Time Series at the U.S. Census Bureau.” Federal Committee on Statistical Methodology 2012 Research Conference. Washington, D.C. www.fcsfm.gov/12papers/Brown_2012FCSM_II-D.pdf
- Dagum, E. B. and Cholette, P. A. (2006), *Benchmarking, Temporal Distribution, and Reconciliation Methods for Time Series*, New York: Springer, Lecture Notes in Statistics 186.

- Denton, F.T. (1971), “Adjustment of Monthly or Quarterly Series to Annual Totals: An Approach Based on Quadratic Minimization.” *Journal of the American Statistical Association*, 82, 99-102.
- Di Fonzo, T. and Marini, M. (2009), Simultaneous and Two-step Reconciliation of Systems of Time Series. In *JSM Proceedings*, Business and Economic Statistics Section. Alexandria, VA: American Statistical Association, pp. 803-817.
- Di Fonzo, T. and Marini, M. (2010), “*Benchmarking and Movement Preservation. Evidences from real-life and simulated series.*” Department of Statistical Sciences, University of Padua, Working Paper Series, n. 14.
<http://www.stat.unipd.it/ricerca/fulltext?wp=422>
- Fagan, J. (1999), “Benchmarking Two Sets of Series to Agree on (Monthly) Totals.” Unpublished research notes, U.S. Census Bureau.
- Latendresse, E., Djona, M. and Fortier, S. (2007), “Benchmarking Sub-Annual Series to annual Totals – From concepts to SAS[®] Procedure and SAS[®] Enterprise Guide[®] Custom Task”, Proceedings of the 2007 SAS *Global Forum*.

Appendix

ORIGINAL SERIES: DENTONQF SOLUTION OPTION SELECTED: TREND(Causey-Trager) REVISED SERIES: OUTDQFST

DATE OF REVISION: 2012-05-11
 TIME OF REVISION: 10:21:44

SPAN OF REVISION: 1 /2001 - 4 /2005

BENCHMARK(S):
 1/2001 - 4/2001 = 500
 1/2002 - 4/2002 = 400
 1/2003 - 4/2003 = 300
 1/2004 - 4/2004 = 400
 1/2005 - 4/2005 = 500

NUMBER OF ITERATIONS TO ATTAIN TREND SOLUTION 30

CARRY FORWARD FACTOR:1.2777050014 ATTAINED VALUE OF TREND FUNCTION:0.0441260253

YEAR	FIRST	SECON	THIRD	FOURTH	TOTAL	CODE
2001	50	100	150	100	400	0
2001	64	127	189	120	500	R
2001	1.280	1.270	1.260	1.200	1.250	R/O
2001	14	27	39	20	100	R-O
2001	0.000	2.000	1.500	0.667		Q/Q-O
2001	0.000	1.984	1.488	0.635		Q/Q-R
2001	0.000	0.000	0.000	0.000		Y/Y-O
2001	0.000	0.000	0.000	0.000		Y/Y-R
2001	0.000	0.000	0.000	0.000	0.000	CUM Y/Y-O
2001	0.000	0.000	0.000	0.000	0.000	CUM Y/Y-R
2002	1.040	1.030	1.020	0.920	1.000	R/O
2002	2	3	3	-8	0	R-O
2002	0.500	2.000	1.500	0.667		Q/Q-O
2002	0.433	1.981	1.485	0.601		Q/Q-R
2002	1.000	1.000	1.000	1.000		Y/Y-O
2002	0.813	0.811	0.810	0.767		Y/Y-R
2002	1.000	1.000	1.000	1.000	1.000	CUM Y/Y-O
2002	0.813	0.812	0.811	0.800	0.800	CUM Y/Y-R
2003	50	100	150	100	400	0
2003	37	74	110	79	300	R
2003	0.740	0.740	0.733	0.790	0.750	R/O
2003	-13	-26	-40	-21	-100	R-O
2003	0.500	2.000	1.500	0.667		Q/Q-O
2003	0.402	2.000	1.486	0.718		Q/Q-R
2003	1.000	1.000	1.000	1.000		Y/Y-O
2003	0.712	0.718	0.719	0.859		Y/Y-R
2003	1.000	1.000	1.000	1.000	1.000	CUM Y/Y-O
2003	0.712	0.716	0.718	0.750	0.750	CUM Y/Y-R
2004	50	100	150	100	400	0
2004	48	96	148	108	400	R
2004	0.960	0.960	0.987	1.000	1.000	R/O
2004	-2	-4	-2	8	0	R-O
2004	0.500	2.000	1.500	0.667		Q/Q-O
2004	0.608	2.000	1.542	0.730		Q/Q-R
2004	1.000	1.000	1.000	1.000		Y/Y-O
2004	1.297	1.297	1.345	1.367		Y/Y-R
2004	1.000	1.000	1.000	1.000	1.000	CUM Y/Y-O
2004	1.297	1.297	1.321	1.333	1.333	CUM Y/Y-R
2005	50	100	150	100	400	0
2005	61	124	187	128	500	R
2005	1.220	1.240	1.247	1.200	1.250	R/O
2005	11	24	37	28	100	R-O
2005	0.500	2.000	1.500	0.667		Q/Q-O
2005	0.565	2.033	1.508	0.604		Q/Q-R
2005	1.000	1.000	1.000	1.000		Y/Y-O
2005	1.271	1.292	1.264	1.185		Y/Y-R
2005	1.000	1.000	1.000	1.000	1.000	CUM Y/Y-O
2005	1.271	1.285	1.274	1.250	1.250	CUM Y/Y-R

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