Differences in Performance between Concurrent and Projected Seasonal Factors for Weekly UI Claims Data[1]

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Key Words: Time Series; Revisions

The U.S. Bureau of Labor Statistics (BLS) seasonally adjusts weekly Unemployment Insurance (UI) data for the Employment and Training Administration (ETA) of the Department of Labor. Although concurrent seasonal adjustment is quite common for monthly and quarterly data, projected factors continue to be the norm for weekly data. Many studies, such as Pierce and McKenzie (1987), suggest that concurrent adjustment will lead to greater accuracy and smaller revisions. However, the assumption that weekly data are likely to be more subject to calendar effects, and also that the program would need to be run 52 or 53 times a year instead of 12 or 4, has led to the continued use of projected factors. Comparisons are made between concurrent estimates with ones projected out 13, 26, or 52 weeks utilizing week-to-week changes and revisions.

1. Introduction

Few weekly time series are seasonally adjusted as official government statistics. Initial claims (IC) and continued claims (CC) from the UI program are the only weekly series that are seasonally adjusted by BLS. Due to the recent severe recession and upcoming presidential election, seasonally adjusted IC data are receiving a great deal of interest in the political and financial worlds. Unfortunately, the variability in the week-to-week changes often confounds data users.[2]

These UI series have been seasonally adjusted since the 1980s with a model-based approach. The approach was first developed for weekly data (Pierce, Grupe, and Cleveland 1984). This work was necessary since traditional seasonal adjustment programs such as X-12-ARIMA and TRAMO/SEATS assume constant periodicity of the data, and Pierce, et al., clearly show the need for a different approach. The first computer program for weekly seasonal adjustment is a regression model described in Cleveland (1986). The modeling capabilities of this program are well developed but the seasonal factors are deterministic. A later program that uses locally weighted regressions to allow for moving seasonality is explained in Cleveland (1993) and Cleveland and Scott (2007) and is used by BLS. A later approach from Harvey, et al. (1997) utilizes structural time series models with time-varying, periodic splines, and is somewhat more complicated.

There are two methods that government agencies produce seasonally adjusted data in the current year. The projected-factor method came first. At the end of each year, agencies typically would forecast seasonal factors for the following year and provide these projected factors to the public in advance. This approach seemed to work well in an era of fewer, more expensive, and slower computers. Later, with greater access to more powerful and inexpensive computers, statisticians began to study concurrent

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[1] Disclaimer: Opinions expressed in this paper are those of the author and do not constitute policy of the Bureau of Labor Statistics.

[2] Note that ETA while publishes a 4-week moving average of seasonally adjusted IC data, unpublished research by BLS shows that this actually does little to smooth the data. Alternative smoothers such as the Butterworth class of filters show more promise in this area.

seasonal adjustment. Under the concurrent method, seasonal adjustment is performed on all newly available data for each quarter, month, or week during the year. Typical improvements from concurrent include smaller period-to-period changes and smaller revisions. Thus, in order to potentially reduce revisions and week-to-week changes, there is interest in either reducing the number of weeks projected out for the current projected factor method or to use the concurrent method.

McKenzie (1984) gives a history of the research on concurrent adjustment that dates back to the 1960s to a recommendation by Wayne Fuller. Statistics Canada and the Bureau of the Census began seeing potential gains from concurrent adjustment in the 1970s and several papers in the 1980s confirmed this. Excellent examples include Dagum (1982), Wallis (1982), Kenny and Durbin (1982), McKenzie (1984), and Pierce and McKenzie (1987). In addition, Methee and McIntire (1987) produced an extensive report on the potential gains from concurrent adjustment for national CPS data. While none of these studies specifically address weekly data, there is no reason to expect different results in general.

Are there any reasons not to apply concurrent seasonal adjustment for IC data? One might be that the production schedule for weekly data is very short. While monthly and quarterly Current Population Survey data at BLS are often adjusted a week in advance of the press release, claims data are received by ETA from states for processing by Tuesday noon. Once the national claims series are calculated and checked, a press release is prepared for release on Thursday morning at 8:30 am. In short, there is much less production time for seasonal adjustment than with other major series.

Another worry about concurrent adjustment has to do with the impact of holidays on weekly series. There have been reservations that concurrent adjustment for weekly data is more susceptible to holidays and should be avoided. Surveys like the Current Population Survey (CPS) avoid many holidays by design. The monthly CPS measures labor force characteristics for a reference week instead of the whole month. One benefit is that using a reference week can be scheduled at a time where holidays are less likely to fall. While Easter is a moving holiday and cannot be totally avoided, major holidays such as New Year's Day, Christmas, Thanksgiving, and July 4th never explicitly fall in the CPS reference week. In contrast, the IC weekly data series is collected for all days and are thus affected by all holidays. This study will examine this concern on concurrent adjustment.

The investigation set forth in this paper compares the use of concurrent and projected factors for weekly IC data. Section 2 briefly explains some of the characteristics of IC data used in this study; Section 3 discusses the methodology used in this paper to assess the differences in performance of the two approaches; Section 4 covers the effects of holidays; Section 5 has the results; and Section 6 offers a summary. Figures and tables are in the appendix.

2. Initial Claims Data

The IC series is the number of workers applying for UI during a new period of unemployment. This contrasts with the Continued Claims (CC) series which is the number of workers currently claiming UI benefits. BLS seasonally uses IC data back to January 1988 for its seasonal adjustment runs.

To get an idea about the properties of IC data, three plots are presented below. Figure 1 has the average seasonal factors for IC by week of year. Seasonality is highest in January and is also relatively high in July and December. Figure 2 shows what the unadjusted IC series and the unrevised seasonally adjusted series using projected factors out one year. The unrevised seasonally adjusted series is smoother but often shows irregular movements. Obviously, data users would like to see a smoother seasonally adjusted series during the year. Figure 3 presents the results of using all available information. The revised seasonally adjusted series is naturally somewhat smoother.

Although the IC data represent an administrative count of the universe of all 50 states plus DC, Puerto Rico, and the Virgin Islands, the week-to-week changes can be rather variable. There are many reasons for this variability. For example, each state administers its own separate UI program within guidelines established by Federal law. If a state cannot process all of the initial claims that it receives in a week, some claims can spill over into other weeks—perhaps causing an artificial spike. Holidays, extreme weather events (e.g., Hurricane Katrina), or the timing of normal economic events can add to the usual variability. In short, the characteristics of IC data can be very complex.

3. Concurrent vs. Projected Factors for IC Data

Each year, BLS provides the Employment Training Administration in the Department of Labor with revised IC seasonally adjusted data for the last 5 years plus projected seasonal factors for the year ahead. Typically, after the end of the calendar year, government agencies produce new historical seasonally adjusted series using all data and revise the concurrent estimates for the current year. However for UI series, BLS waits until data are available for the whole month of January to make the seasonal adjustment runs. The reason for waiting is to dampen the effects of New Year's Day and the usual strong spike in claims early in the year on the forecasts. Official runs use data from the last week of January 1988 through the last week of January in the current year. Utilizing a long time series is also needed to reasonably estimate the numerous holiday effects.

Much research has been performed over the years at BLS to improve the seasonal adjustment for claims data. What else can be done? One possibility is to test a model that will produce a true time series decomposition and an approach similar to Harvey, et al., (1997) can do this. A simpler possibility is to test projected factors with shorter forecasts lengths or, better yet, to use concurrent adjustment.

To assess differences between concurrent and projected factor adjustments for IC data, many seasonal adjustment runs are required since one year is not enough for comparisons. Runs projecting seasonal factors out 13 and 26 weeks are important as well since one would normally expect some gains from shorter forecast periods. To eliminate effects from revisions, only final revised data are used. After the last week in a year, outliers from the official run are added to the last year (if any). This was performed over the years 2000-2011. Since the forecast period begins at the end of January for each year, this means that the other projected runs will start (depending on the projection length) with data at the end of April, July, and October—which will also avoid holidays directly at the end of the historical data for the forecasts. Note that there is overlap in the forecasts so many of the forecasts are identical even with different forecast lengths.

Root mean square (RMS) ratios are often used to show gains in smoothness from concurrent estimation. Examples of the necessary formulae follow. The RMS for concurrent revisions is

$$RMS(r_t^c) = \sqrt{\frac{1}{N}\sum_{1}^{N}\left(r_t^c\right)^2}$$

where (r_t^c) is the revision from concurrent estimation at time *t*. The ratio for the concurrent estimates to that for 13-month projected factors is

$$\frac{RMS(r_t^c)}{RMS(r_t^{p13})}$$

where is the revision from 13-month projected factor estimation at time *t*. The gain for concurrent estimation is seen when an RMS ratio is < 1.

4. Holidays Effects on Weekly IC Data

As stated above, all holidays have the potential to affect the number of initial claims submitted for a particular week. Table 1 has a list of the holidays that are modeled (and effects permanently removed from the seasonally adjusted series).

Holidays are especially complicated with weekly data since the number of days and weeks in a year varies. Some can even require special weighting. Holidays can also fall in a different week of the year as the calendar moves through its cycle. Examples include Thanksgiving falls in either week 47 or 48, Labor Day in week 36 or 37, and Easter in weeks 12-18.

Most of the events cause a drop in claims filed, but New Year's and user-defined events July 4th on Wednesday and Christmas in week 53 actually cause a rise in IC. Figure 4 shows this visually. The plot has the unadjusted (NSA or not seasonally adjusted) and holiday-adjusted series for 2011. Note the drop in the holiday-adjusted series for New Year's and Christmas in week 53 (July 4th on Wednesday did not occur in 2011). The other modeled holidays in the plot show an increase in the holiday-adjusted series compared to the NSA series. In all cases, the holiday-adjusted series appears smoother around holidays.

In the past, claimants had to go to a claims office to file. This helps explain weekly drops in claims for some holidays where the offices were closed. Claimants may also be too busy to file during a holiday week. Interestingly, all, or almost all, initial claims are now actually filed through the Internet. Yet, the effects of these holidays have not diminished in recent years.

One of the known problems with concurrent adjustment is that extreme events might distort seasonal adjustment for the current period. For example, events like Hurricane Katrina and 9/11 could have this effect on some series. Of course, issues with outliers on concurrent adjustment are important regardless of the periodicity. But the potential impact of holidays on concurrent also causes concern. For this reason, concurrent adjustment could be considered risky without significant testing. Due to the effects of holidays on IC data, some of the statistics shown below are also broken down for holidays and non-holidays.

5. Results

Tables 2 and 3 have the main results for the comparisons in week-to-week changes and revisions. As seen in Table 2, the mean absolute % change (MAPC) for concurrent estimation over the 2000-2011 period is 3.5% (non-holidays). This is lower than those for projected factors for 13, 26, and 52 weeks of about 4.2%. While the advantage here for concurrent is not huge, it is helpful. The maximum percent changes (MPC) for non-holidays are much larger due to Hurricane Katrina and 9/11. Still, the concurrent MPC is a little smaller. If you eliminate those two tragic events from the week-to-week changes, the max is less than 7%. End-of-year revisions in Table 3 show a similar story for non-holidays. The MAPC is only 1.2 % compared to about 1.7% for the projected series. The maximum revisions were again smaller for concurrent (4.9% vs. 8-8.2%).

For holidays, concurrent estimation again holds up. Overall, the MAPC and MPC are lower for concurrent (Table 2). Again, the MPC for holidays is high since Labor Day fell shortly after Hurricane Katrina. Revisions at holidays (Table 3) are again smaller for concurrent.

RMS ratios are in Table 4. For week-to-week changes, the RMS ratio for concurrent and 13-week projected factors is 0.77. This indicates a 23% gain from using concurrent. The same ratio for end-of-year revisions is 0.84—smaller but still important. The RMS ratios for 26- and 52-week projected factors are similar to those for 13 weeks.

A final interesting result is that shortening the horizon for projected factor from 52 weeks to 26 weeks or 13 weeks surprisingly shows no significant gains at all. These results imply that an obvious improvement to current procedures is a move to concurrent estimation.

A comparison of seasonally adjusted estimates for 2011 is in Figure 4. As expected, the concurrent estimates are generally smoother than those for 52-week projections and the revised estimates (from an end-of-year run) is often the smoothest.

6. Summary

Results from this study show:

- Concurrent estimation for weekly IC data shows worthwhile gains for both week-to-week changes and year-end-revisions.
- Revisions and week-to-week changes for holidays are lower for concurrent estimation.
- For the projected factor method, little gain, if any comes from using shorter projections than 52 weeks.

Appendix

Figure 1: Average IC Multiplicative Seasonal Factors by Week of Year

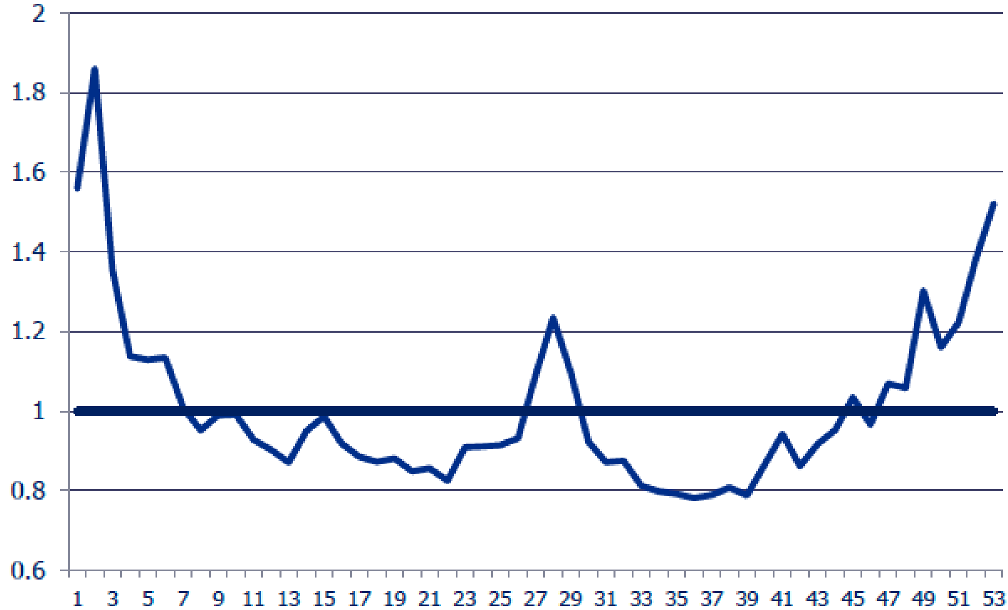

Figure 2: Unadjusted IC vs. Unrevised IC Seasonally Adjusted

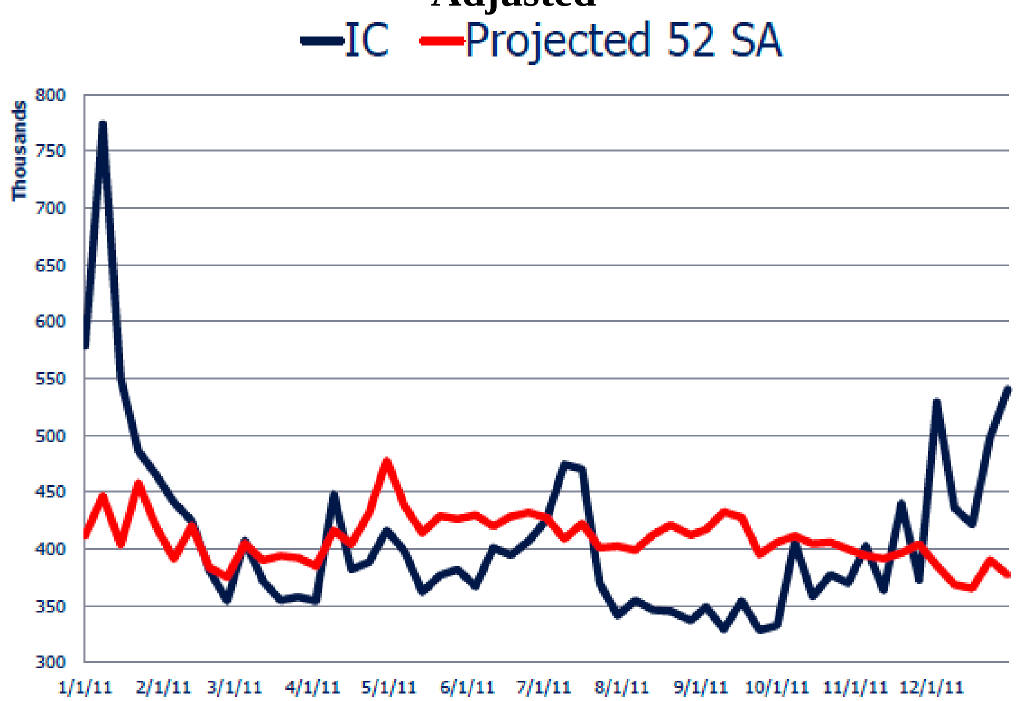

Figure 3: Preliminary Seasonally Adjusted IC vs. Revised

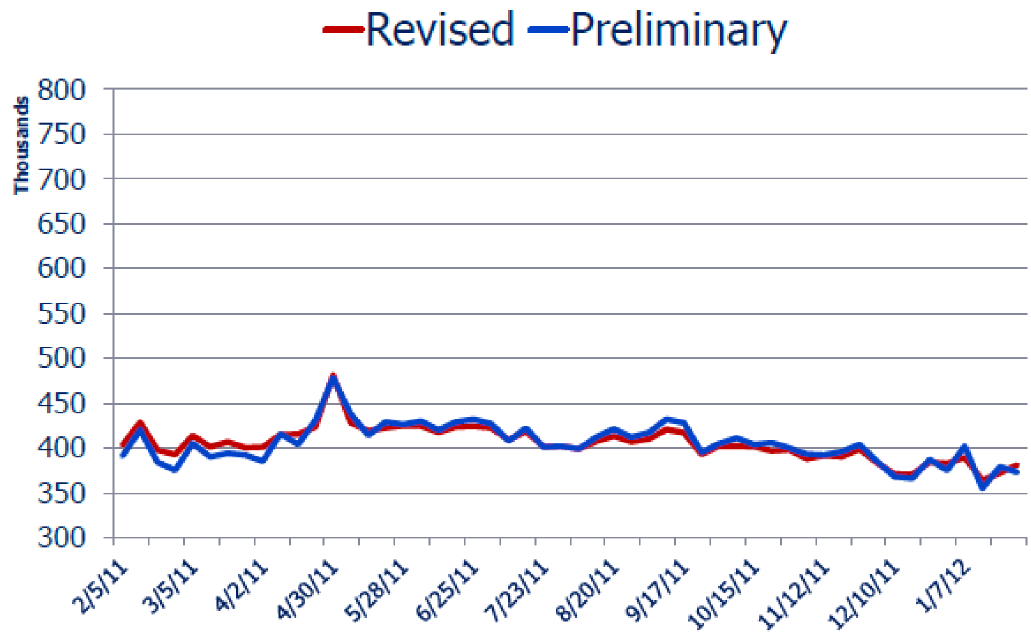

Figure 4

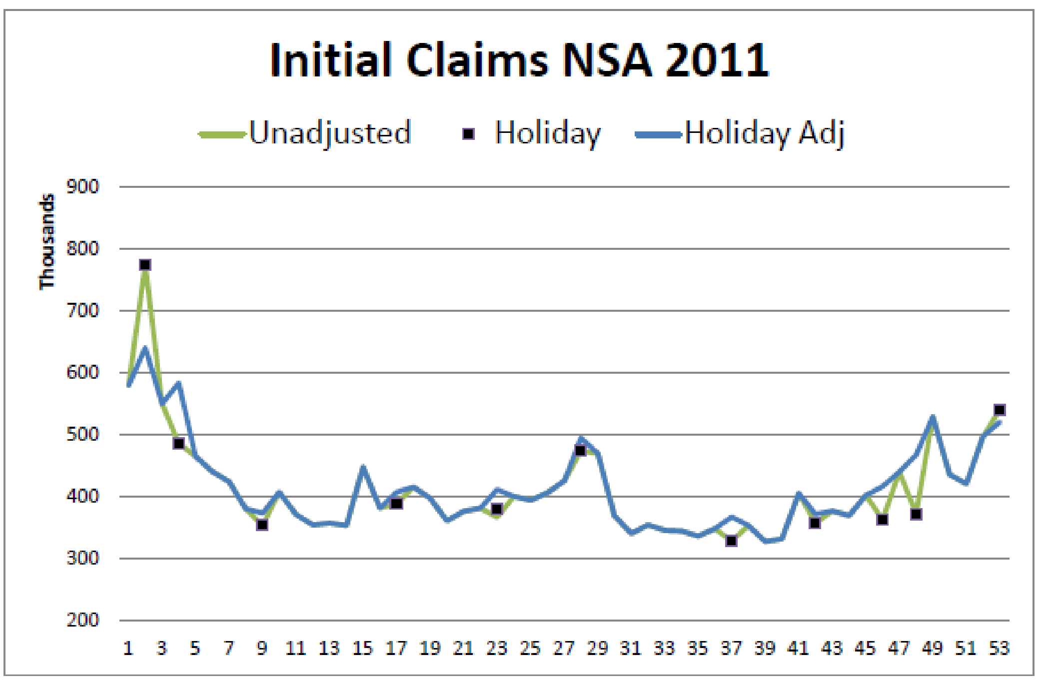

Figure 4: Seasonally Adjusted IC for 2011

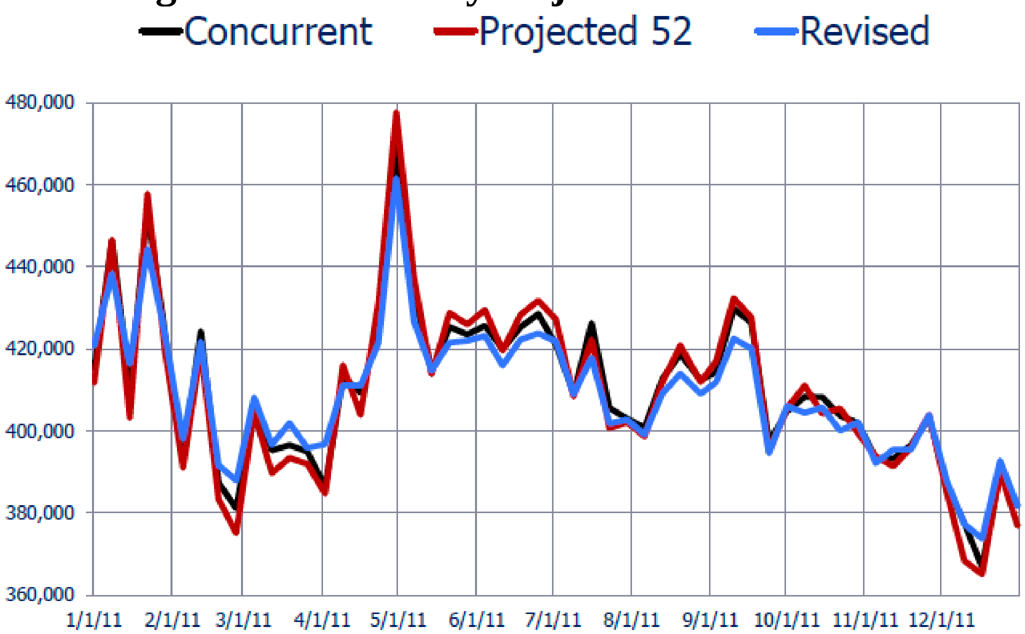

Table 1

Holidays Modeled for Initial Claims	
New Year's Day	Labor Day
MLK Day	Columbus Day
President's Day	Veteran's Day
Easter	Thanksgiving
Memorial Day	Xmas on Friday
July 4th	Xmas in week 53
July 4th on Wednesday	

Table 2: Week-to-Week Changes

Adjustment	Mean Absolute % Change		Max %	
	Non-Holidays	Holidays	Non-Holidays	Holidays
Concurrent	3.54	3.88	23.08	20.29
Projected 13 weeks	4.20	4.83	24.86	22.77
Projected 26 weeks	4.18	4.84	24.86	22.77
Projected 52 weeks	4.18	4.86	24.87	22.83

Table 3: End-of Year Revisions

Adjustment	Mean Absolute % Change		Max %	
	Non-Holidays	Holidays	Non-Holidays	Holidays
Concurrent	1.24	1.34	4.87	7.85
Projected 13 weeks	1.68	1.81	8.23	7.94
Projected 26 weeks	1.68	1.88	8.23	7.94
Projected 52 weeks	1.67	1.85	7.97	7.67

Table 4: Root Mean Square Ratios

Adjustment	Week-to-Week Changes	End-of-Year Revisions
Projected 13 weeks	0.77	0.84
Projected 26 weeks	0.76	0.85
Projected 52 weeks	0.78	0.85

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