

2.4.4 → Determining trend periods

- Overview → After selecting trend amounts, the next step is to determine the length of time the trend should be applied, i.e. the trend period.
- In general, we are using historical data from the historical period, i.e. the experience period, & adjusting it to the period when the new rates will be in effect, i.e. the forecast period. The experience & forecast periods depend on several factors, such as:
- The type of data (e.g. EP or WP or losses)
 - The length of the policy term (e.g. 6 or 12 months)
 - The type of data representation (e.g. calendar/accident year or policy year)
 - The length of time rates are expected to be in effect
- We'll go through the examples below to demonstrate the differences. Focus on understanding how to find the experience & forecast periods.
- Thus, the trend period will be from an appropriate date in the experience period to an appropriate date in the forecast period. In order to streamline this process, the following assumptions are generally applied:
- Policies are written uniformly over time
 - Premiums are earned uniformly over the policy period
 - Losses are incurred uniformly over the policy period
- w/ these assumptions, the trend period is the length of time from the midpoint of the experience period to the midpoint of the forecast period.
- Note that each historical period (e.g. each historical CY) is treated separately, but to the same future date. For example, assume data from CYs 2016, 2017 & 2018 is used to estimate rates that will be in effect during CY 2020. The forecast period will be the same for each year's data, but CY2016, CY2017, & CY2018 data will each have different experience periods.

→ one-step Trending

- The one-step trending approach involves applying a single trend to historical data to adjust it to the forecast period. Consider the following comments of how to determine the trend period for one-step trending:

→ Forecasting WP

- When forecasting WP using an estimated WP trend, the trend period will be from the average written date in each historical period to the average written date at the new rate level.
- If we assume policies are written uniformly over time, the average written date is:
 - for the experience period: the midpoint of the first & last dates that policies were written in the historical period
 - for the forecast period: the midpoint of the first & last dates that policies were written at the new rates

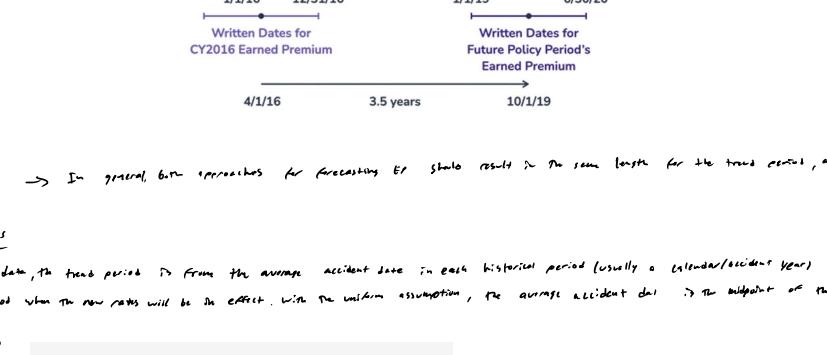
→ Consider an example.

You are given the following information:

- All policies are annual.
- The future policy period begins January 1, 2019.
- The proposed rates will be in effect for 18 months.

Determine the trend periods for CY2016 and CY2017 written premium.

- CY 2016 WP can come from policies written between 1/1/2016 & 12/31/2016. So, assuming policies are written uniformly over this period, the average written date is the midpoint of the year 7/1/2016.
- Likewise, CY2017 WP can come from policies written between 1/1/2017 & 12/31/2017, so the midpoint for CY2017 WP is 7/1/2018.
- Since the proposed rates are expected to be in effect from 1/1/2019 to 6/30/2020, the average written date in the future period is the midpoint on 10/1/2019. Therefore,
- the trend period for CY2016 WP is from 7/1/2016 to 10/1/2019, which is 3.25 years.
- the trend period for CY2017 WP is from 7/1/2017 to 10/1/2019, which is 2.75 years.



→ Forecasting EP

- For a remaining analysis, it is more common to forecast EP, rather than WP. However, the trend percentage used for forecasting EP can be estimated from EP data or WP data.
- If the trend is estimated from EP data, the trend period will be from the average earned date in each historical period to the average earned date at the new rate level. Or, if the uniform assumption, the average earned date of a period is the midpoint of the first & last dates that premium could be earned in that period. So, these dates will depend on the policy term length.
- EP is forecasted from WP data (which is standard), the trend period will start at the average written date for a time period of EP. This is not necessarily the same thing as the average written date for WP.

You are given the following information:

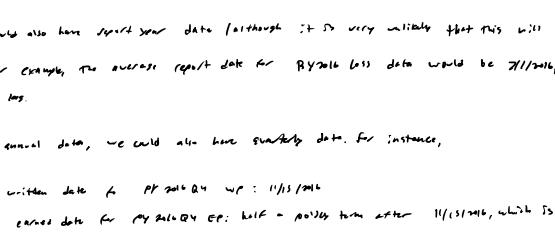
- All policies have 6-month terms.
- The future policy period begins January 1, 2019.
- The proposed rates will be in effect for 18 months.

Determine the trend period for CY2016 earned premium assuming

1. the trend amount is based on earned premium.
2. the trend amount is based on written premium.

- CY 2016 EP is earned starting on 1/1/2016 & ending on 12/31/2016, which means the midpoint of the experience period is 7/1/2016.
- Since the policies have 6-month terms, the policies written at the new rates (i.e. from 7/1/2019 to 6/30/2020) will each complete between 1/1/2019 & 12/31/2020. So, the midpoint of the forecast period is 1/1/2020.

- Therefore, the trend period for CY 2016 EP, where the trend amount is based on EP, is 3.5 years. This is shown in the graph below.



- In general, both approaches for forecasting EP should result in the same length for the trend period, as seen in the example above.

→ Forecasting losses

- For loss data, the trend period is from the average accident date in each historical period (usually a calendar/accident year) to the average accident date for the period when the new rates will be in effect. With the uniform assumption, the average accident date is the midpoint of the accident period.

→ Example →

You are given the following information:

- All policies are annual.
- The future policy period begins January 1, 2019.
- The proposed rates will be in effect for 12 months.

Determine the trend period for AY2016 losses.

- AY 2016 losses can come from claims that occur between 1/1/2016 & 12/31/2016, so the average accident date is the midpoint of the year, or 7/1/2016.

- The policies have annual terms, if the new rates will be in effect from 7/1/2019 to 12/31/2019. So, these policies can have claims between 1/1/2019 & 12/31/2020 (i.e. up to one policy term after 12/31/2018). The average accident date is the midpoint of this period, or 10/1/2019.

- Therefore, the trend period for AY 2016 EP, where the trend amount is based on WP, is 1.5 years, as shown in the graph below.

- In general, both approaches for forecasting EP should result in the same length for the trend period, as seen in the example above.

→ Applying a trend

- Typically, the trend used will be the estimated percentage that the data will change from one time period to the next. In that case, we can calculate a trend factor using the selected trend & the trend period. Then, we can trend historical data using the trend factor.

→ Example →

You are given the following information:

- All policies are annual.
- The future policy period begins January 1, 2019.
- The proposed rates will be in effect for 12 months.

Determine the AY2016 trended ultimate loss.

- We determined above that the average accident date for AY2016 losses is 7/1/2016, & the average accident date for the future policy period is 10/1/2019, which means the trend period is 3.5 years.

- So, the trend factor is

$$(1 + 0.03)^{3.5} = 1.1090$$

- The AY2016 trended ultimate loss is

$$1.1090(11,500) = 12,759.40$$

- In a linear trend is selected instead, then recall that each time period will change by a constant amount, instead of a constant percentage. In that case, the projected change can be found by multiplying together the selected trend & the length of the trend period. For example, if the annual loss trend is an increase of 100 per year, the the loss after 3.5 years is $100 \times 3.5 = 350$.