Aggregating Premium

20M

Premium is the amount paid for an insurance policy. Similar to losses, premium data should be **aggregated**, **brought to the current rate level**, and **trended**. In this section, we will discuss how to aggregate premium data and bring it to the current rate level. However, premium trending is not tested on this exam, so we will not discuss it here.

Premium data can be aggregated using two common methods: calendar year and policy year.

- *Calendar year aggregation* considers the premiums of all active policies in a twelve-month **calendar year** from January 1 to December 31.
- *Policy year aggregation* considers the premiums of all **policies that are issued** during a twelve-month period.

Similar to loss aggregation, the twelve-month period does not need to be a calendar year for policy year aggregation. It can be any period of twelve months, e.g. May 1 to April 30.

Premiums can be defined in three ways: *written premium* (P^W), *earned premium* (P^E), and *unearned premium* (P^U).

- Written premium is the total amount of premium for all policies issued in a specified period of time.
- Earned premium is the portion of premium that corresponds to the **expired** portion of policies at a given point in time.
- Unearned premium is the portion of premium that corresponds to the **unexpired** portion of policies at a given point in time. At any time during the life of a policy, the unearned premium is the difference between the written premium and earned premium.

Depending on the data aggregation method, the given point in time for the determination of earned and unearned premiums differs.

- Under calendar year aggregation, the point in time is the **end of the calendar year**.

- Under policy year aggregation, the point in time is the specified **valuation date**.

Consider the following example.

A one-year insurance policy with a premium of 400 is in effect from October 1, 2015 to September 30, 2016.

Calculate the earned, unearned, and written premiums for calendar year 2015 and policy year 2015 as of June 30, 2016.

Let's start with CY2015. Since the policy is written in 2015, the CY2015 written premium is 400.

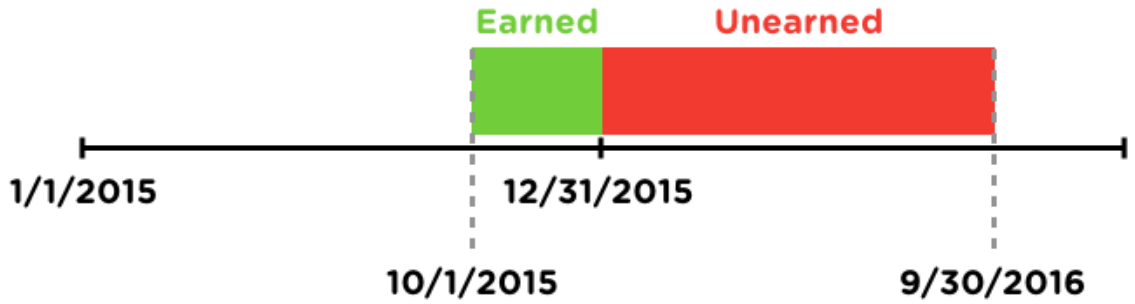
$$P^{W}_{\text{CY2015}} = \mathbf{400}$$

The earned premium for CY2015 is the portion of premium that corresponds to the expired portion of policies at the end of calendar year 2015. Then, the CY2015 earned premium is 100 because one-fourth of the policy expires in 2015.

$$P^{E}_{\text{CY2015}} = \mathbf{100}$$

The CY2015 unearned premium is 300 because three-fourths of policy has not expired as of 12/31/2015, so that portion of the premium is unearned.

$$P^{U}_{\text{CY2015}} = \mathbf{300}$$



Let's observe how this differs from policy year aggregation. Since the policy is written in 2015, the written premium for policy year 2015 is the same as it was for calendar year 2015.

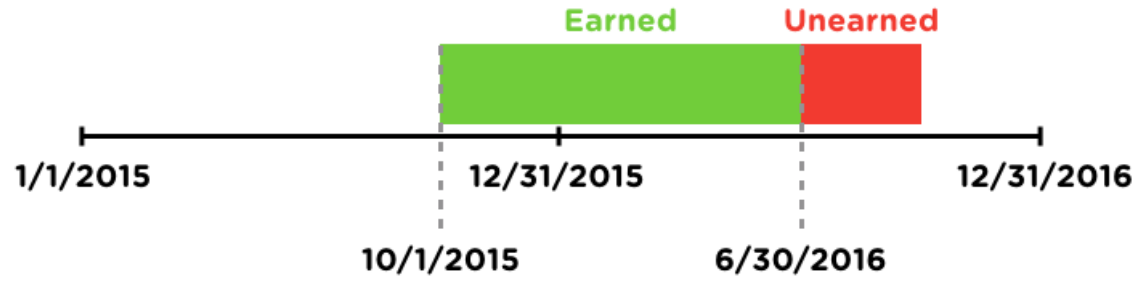
$$P^{W}_{\text{PY2015}} = \mathbf{400}$$

The earned premium for PY2015 is the portion of premium that corresponds to the expired portion of policies as of the valuation date. As of 6/30/2016, three-fourths of the premium is earned, so the earned premium for PY2015 is 300.

$$P^{E}_{\text{PY2015}} = \mathbf{300}$$

Therefore, the unearned premium for PY2015 as of 6/30/2016 is:

$$P^{U}_{\text{PY2015}} = \mathbf{100}$$



If the valuation date were to be any date after 9/30/2016, the earned premium for PY2015 would be equal to the written premium for PY2015.

Instead of calculating the calendar year unearned premium, P_i^U, for all policies by summing each individual policy's unearned premium, we can calculate the total as:

$$P_i^U = P_i^W - P_i^E + P_{i-1}^U \qquad (S5.2.5.1)$$

where:

- P_i^W is the written premium for calendar year i.
- P_i^E is the earned premium for calendar year i.
- P_{i-1}^U is the unearned premium at the end of calendar year $i-1$.

Let's practice the concept of written, earned, and unearned premiums in the next example.

Example S5.2.5.1

People's Insurance Company issued the following policies:

Policy	Effective Date	Expiration Date	Premium
A	10/1/2015	9/30/2016	300
B	1/1/2016	12/31/2016	400
C	4/1/2016	3/31/2017	360
D	7/1/2016	6/30/2017	380

Calculate:

1. the written premiums for calendar years 2015, 2016, and 2017.
2. the earned premiums for calendar years 2015, 2016, and 2017.
3. the unearned premium for calendar year 2016.

Solution to (1)

The calendar year written premiums are tabulated below:

Policy	Premium	Written Premium		
		CY2015	CY2016	CY2017
A	300	300	-	-
B	400	-	400	-
C	360	-	360	-
D	380	-	380	-
Total	**1,440**	**300**	**1,140**	**-**

$$P^W_{\text{CY2015}} = \mathbf{300}$$
$$P^W_{\text{CY2016}} = \mathbf{1{,}140}$$
$$P^W_{\text{CY2017}} = \mathbf{0}$$

Solution to (2)

Let's look at policy A. Three months of the policy expired in 2015, and the remaining nine months expired in 2016. This means that one-fourth of policy A's written premium is earned in CY2015, and the other three-fourths is earned in CY2016. Thus:

- the CY2015 earned premium for policy A is 75, and
- the CY2016 earned premium for policy A is 225.

Perform similar calculations for policies B, C, and D. The calendar year earned premiums are tabulated below:

Policy	Premium	Earned Premium		
		CY2015	CY2016	CY2017
A	300	75	225	-
B	400	-	400	-
C	360	-	270	90

Policy	Premium	Earned Premium		
		CY2015	CY2016	CY2017
D	380	-	190	190
Total	**1,440**	**75**	**1,085**	**280**

$$P^E_{\text{CY2015}} = \mathbf{75}$$
$$P^E_{\text{CY2016}} = \mathbf{1{,}085}$$
$$P^E_{\text{CY2017}} = \mathbf{280}$$

Solution to (3)

Policies A and B expire in 2016 while policies C and D are still in effect at the end of 2016. So, there is unearned premium on policies C and D at the end of 2016.

- As of 12/31/2016, policy C has three more months until expiration. Thus, one-fourth of policy C's written premium has yet to be earned. This means the unearned portion for 2016 is 90.
- As of 12/31/2016, policy D has six more months until expiration. Thus, one-half of policy D's written premium has yet to be earned. This means the unearned portion for 2016 is 190.

Therefore, the CY2016 unearned premium is:

$$\begin{aligned} P^U_{\text{CY2016}} &= 90 + 190 \\ &= \mathbf{280} \end{aligned}$$

Alternative Solution to (3)

We can also calculate this using $(\mathbf{S5.2.5.1})$:

$$P^U_{\text{CY2016}} = P^W_{\text{CY2016}} - P^E_{\text{CY2016}} + P^U_{\text{CY2015}}$$

We know that:

- $P^W_{\text{CY2016}} = 1{,}140$
- $P^E_{\text{CY2016}} = 1{,}085$

The unearned premium as of the end of CY2015 is 225 since policy A is the only policy written in CY2015 with an unearned portion. Thus:

$$\begin{aligned} P^U_{\text{CY2016}} &= 1{,}140 - 1{,}085 + 225 \\ &= \mathbf{280} \end{aligned}$$