

Notational Differences Between *Actuarial Mathematics (AM)* and *Models for Quantifying Risk (MQR)* for Candidates Taking Exam 3

There are several notational differences between the two texts. The ones listed in this note are the ones that may appear on the examination. Examination questions will be written so that candidates will not be disadvantaged by the text they used.

1. Force of mortality

MQR uses μ_x or μ_{x+t} . The subscript is always the current age. *AM* uses $\mu(x)$, $\mu(x+t)$, or $\mu_x(t)$. The first two refer to attained ages while the third one is reserved for indicating selection at age x and attained age $x+t$. Any of these symbols may appear on the exam.

2. Survival function

AM uses $s(x)$ while *MQR* uses $S(x)$. Either symbol may appear on the exam.

3. Future Complete lifetime

MQR uses T_x while *AM* uses $T(x)$ for the future complete lifetime of (x) . Either symbol may appear on the exam. The same comment applies for joint life, T_{xy} or $T(xy)$, and last survivor statuses, $T_{\overline{xy}}$ or $T(\overline{xy})$.

4. Future Curtate Lifetime

In *AM* the random variable $K(x)$ is always the full number of years lived by (x) prior to death. *MQR* uses the same variable in the same way, but also uses $K_x = K(x) + 1$. In these situations the text of the question will define any notation used.

5. Present value of future losses

AM uses L or ${}_0L$ for loss at issue and ${}_tL$ for loss from t years after issue. *MQR* at times adds other pieces to the symbol to describe the policy. The exam will use the generic notation from *AM* and describe the policy in the text of the problem.

6. Duration subscripts

At various times the texts count duration differently. Something happening in the first year (between ages x and $x+1$) may be identified with a 0 or 1. For example, *AM* would refer to a premium for year 1, payable at time 0, with subscript 0. *MQR* would use the subscript 1 for such a premium. In these situations the text of the question will define any notation used.

7. Life table symbols

MQR uses \int_x while *AM* uses l_x . Either symbol may appear on the exam.

8. Types of insurance

AM defines a “fully discrete” insurance as one in which both premiums and benefits are paid only at discrete time points: premiums at the start of the year; death benefits at the end of the year of death. *MQR* does not define such a policy. The terminology will be used in the exam. Both texts define “semi-continuous” (continuous benefits, discrete premiums) and “fully continuous” (both continuous), although *MQR* does so only in a footnote. These terms will be used on the exam.

9. Premiums determined by the equivalence principle

The term “benefit premiums” is used in both texts. In *MQR* it is not explicitly stated that such premiums are determined by the equivalence principle ($E(L) = 0$). For the exam, the term “benefit premium” implies that the premium is determined by the equivalence principle. *MQR* also uses “net premium” in this context. The term “net premium” will not be used in the exam. Likewise, the term “benefit reserves” on the exam will imply that the equivalence principle was used.

10. Premium that includes expenses

AM uses the term “expense-loaded premium” to denote premium that includes expenses in addition to the benefit premium. *MQR* uses the terms “gross premium” and “expense-augmented premium” to denote premium that includes expenses in addition to the benefit premium. Both texts use the symbol G to denote this premium. The term “expense-loaded premium” will be used on the exam. The related term “expense-augmented loss random variable”, comparable to the loss at issue random variable but including expenses, will also be used.

Both texts also use the symbol G to denote the level contract premium or level gross premium, the premium paid for the insurance. When the symbol G is used on the exam the meaning of the symbol will be defined in the question.

11. Special insurance policies

This applies to neither text, but is a convention used in the exam. In some problems, reference is made to a “special insurance policy.” Such policies have non-level benefits, premiums, or both, which are then described in the question. If an insurance policy is not defined as “special” then premiums and benefits are assumed to be level, unless there is explicit information to the contrary.