a/s/m

Actuarial Study Materials

Learning Made Easier

Flashcards for CAS Exam MAS-I

1st Edition, Fifth Printing

Introductory Note for ASM Flashcards for Exam MAS-I

These flashcards will help you remember important formulas and concepts for Exam MAS-I. This introduction discusses the features of the cards.

On the back of each card, the left header states the broad topic for the card's content.

The left footer provides a cross-reference to the lesson number, page number, and table or formula number where applicable, of the first edition fifth printing of the ASM MAS-I manual. If you are using the third or fourth printings, the lesson number is the same, but the page number may differ. Earlier printings do not have Lesson 41, and thus 1 should be subtracted from references to higher-numbered lessons.

On both the front and the back of each card, the right header indicates the importance of the card. The rating system is given in Table 1.

While flashcards are a useful study aid, they do not replace working out tons of exercises. Flashcards are limited to formulas or concepts that can be expressed briefly on a card, and only offer limited coverage to models such as Poisson processes, where the main challenge is knowing which formula to apply. The number of flashcards for a topic depends on the number of formulas for that topic, but is not necessarily a measure of the importance of a topic.

If you find any errors in these cards, check the errata list at

`errata.aceyourexams.net`

If the error is not listed there, please send them to the publisher at

`mail@studymanuals.com`

or send them to me directly at

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When you send errata in, identify this publication as "MAS-I Flashcards, 1st edition, 5th printing".

Table 1: Rating system

★★★★★	Essential—appears repeatedly on every exam
★★★★	Important—appears on every exam
★★★	Average importance—regularly appears on exams
★★	Not so important—appears occasionally on exams, or easy to derive as needed
★	Obscure—on syllabus, but unlikely to appear on exam. No released exam uses this formula or concept, and students have never reported a question from an unreleased exam requiring this formula or concept.

★★★★

Definition of bias

$$\mathrm{bias}_{\hat{\theta}}(\theta) = \mathbf{E}[\hat{\theta}] - \theta$$

★★★

Bias of sample mean

0

★★★

Bias of biased sample variance

$$\mathrm{bias}_{\hat{\sigma}^2}(\sigma^2) = -\frac{\sigma^2}{n}$$

★★★★

Definition of consistency

Consistency *means that the probability that the estimator is different from the parameter by more than* ϵ *goes to 0 as the sample size goes to infinity.*

★★★

Sufficient condition for consistency

Estimator is asymptotically unbiased and its variance goes to 0 as the sample size goes to infinity.

★★★

Definition of relative efficiency of estimator θ_1 to estimator θ_2

120F

$$\frac{\operatorname{Var}(\hat{\theta}_2)}{\operatorname{Var}(\hat{\theta}_1)}$$

★★★★

Definition of mean square error of estimator

$$\mathrm{MSE}_{\hat{\theta}}(\theta) = \mathbf{E}[(\hat{\theta} - \theta)^2]$$

★★★★

Formula for mean square error

Estimator Quality ★★★★

$$\mathrm{MSE}_{\hat{\theta}}(\theta) = \mathrm{bias}_{\hat{\theta}}(\theta)^2 + \mathrm{Var}(\hat{\theta})$$

Lesson 25, page 289, formula (25.4) 122B

★★

Definition of UMVUE

123F

*A **uniformly minimum variance unbiased estimator** is an unbiased estimator has the lowest variance of any unbiased estimator regardless of the true value of θ, the estimated parameter.*

★★★★

Definition of exponential family

Extended Linear Model ★★★★

$$f(y;\theta) = \exp\big(a(y)b(\theta) + c(\theta) + d(y)\big)$$

Lesson 44, page 600, formula (44.2) 222B

★★★★

Canonical form of exponential family and natural parameter

Canonical form: $a(y) = y$
Natural parameter: $b(\theta)$

Examples of members of exponential family

Extended Linear Model ★★★

- *binomial*
- *normal*
- *Poisson*
- *exponential*
- *gamma*
- *inverse Gaussian*
- *negative binomial*
- *compound Poisson/gamma*

★★

$\mathbf{E}[Y]$ *for* Y *exponential in canonical form*

$$\mathbf{E}[Y] = -\frac{c'(\theta)}{b'(\theta)}$$

★★

$\mathrm{Var}(Y)$ *for Y exponential in canonical form*

$$\mathrm{Var}(Y) = \frac{b''(\theta)c'(\theta) - c''(\theta)b'(\theta)}{\big(b'(\theta)\big)^3}$$

★★

Definition of Tweedie distribution

$$\mathrm{Var}(Y) = a\,\mathbf{E}[Y]^p$$