

The University of Texas at Austin
IN-CLASS WORK 2

M339D Introduction to Financial Mathematics

August 31, 2026

PROBLEM 2.1: Write down the **definition** of the effective interest rate for the time period $[t_1, t_2]$ in terms of the accumulation function $a(\cdot)$.

PROBLEM 2.2: Find the total amount of interest that would be paid on a \$1,000 loan over a 10 — year period, if the effective interest rate is 0.09 per annum and the entire loan plus entire accumulated interest is paid as one lump sum at the end of the loan term.

PROBLEM 2.3: Source: Exam FM/2, May 2005, Problem #7.

Mike receives cash flows of 100 today, 200 in one year, and 100 in two years. The net present value of these cash flows is 364.46 at an annual effective interest rate i . Calculate i .

- a. About 10%
- b. About 11%
- c. About 12%
- d. About 13%
- e. None of the above

PROBLEM 2.4: Write down the **definition** of the (time-varying) **force of interest** in terms of the accumulation function $a(\cdot)$.

DEFINITION 2.5: In the context of financial markets, the constant force of interest is usually referred to as the **continuously compounded, risk-free interest rate** and denoted by r .

PROBLEM 2.6: Let the accumulation function be given by

$$a(t) = (1 + 0.05)^{3t}(1 + 0.02)^{t/2}.$$

Then, we can say the following about the continuously compounded, risk-free interest rate r associated with the above accumulation function:

- a. $r = 0.07$
- b. $r = \ln(1.05) + \ln(1.02)$
- c. $r = 3 \ln(1.05) + 0.5 \ln(1.02)$
- d. The continuously compounded, risk-free interest rate is not constant.
- e. None of the above

PROBLEM 2.7: Let r be the continuously compounded, risk-free interest rate. What is the expression for the accumulation function $a(\cdot)$ in terms of r ?

PROBLEM 2.8: Roger deposits \$100 into an account at time 0. He does not make any withdrawals or deposits and the account earns at a continuously compounded, risk-free interest rate r . After 15 years and 6 months, the balance in his account equals \$133. Then,

- a. $0 \leq r < 0.0150$
- b. $0.0150 \leq r < 0.0250$
- c. $0.0250 \leq r < 0.0550$
- d. $0.0550 \leq r < 0.0650$
- e. None of the above