

38. For $t \leq T$, let $P(t, T, r)$ be the price at time t of a zero-coupon bond that pays \$1 at time T , if the short-rate at time t is r .

You are given:

- (i) $P(t, T, r) = A(t, T) \times \exp[-B(t, T)r]$ for some functions $A(t, T)$ and $B(t, T)$.
(ii) $B(0, 3) = 2$.

Based on $P(0, 3, 0.05)$, you use the delta-gamma approximation to estimate $P(0, 3, 0.03)$, and denote the value as $P_{Est}(0, 3, 0.03)$

Find $\frac{P_{Est}(0, 3, 0.03)}{P(0, 3, 0.05)}$.

- (A) 1.0240
(B) 1.0408
(C) 1.0416
(D) 1.0480
(E) 1.0560