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27 2025 .

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() — $\{B(t)\}_{t \geq 0}$,

$$\frac{dB(t)}{dt} = r(t) B(t), \quad r(t) \text{ — } .$$

$$B(0) = 1.$$

$$B(t) = \exp\left(\int_0^t r(s) ds\right).$$

$$r(t) \equiv r \quad :$$

$$B(t) = e^{rt}.$$

() $B(t)$, ,
 r . :

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- **Numeraire** —

$[0, T]$

Δt :

$$0, \Delta t, 2\Delta t, \dots, n\Delta t = T, \quad \Delta t = \frac{T}{n}.$$

,

$$B(t + \Delta t) = B(t)(1 + r\Delta t).$$

n

$$B(T) = B(0) (1 + r\Delta t)^n.$$

$$\Delta t \rightarrow 0 \quad (n \rightarrow \infty),$$

$$\lim_{\Delta t \rightarrow 0} (1 + r\Delta t)^{T/\Delta t} = e^{rT}.$$

,

$$\frac{dB(t)}{dt} = \lim_{\Delta t \rightarrow 0} \frac{B(t + \Delta t) - B(t)}{\Delta t} = rB(t).$$

$r = 16,5\% = 0.165.$
 $B(0) = 100\,000$, :
 $(T = 1)$.

1. $B_1(1)$ ($n = 1$):

$$B_1(1) = 100\,000 \left(1 + \frac{0.16}{1}\right)^1 = 100\,000 \cdot 1.16 = \mathbf{116\,000} \quad .$$

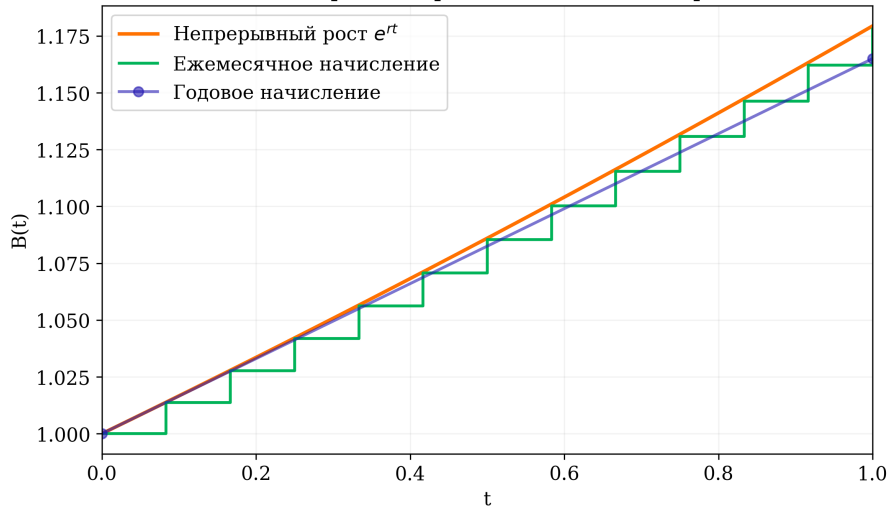
2. $B_{12}(1)$ ($n = 12$):

$$B_{12}(1) = 100\,000 \left(1 + \frac{0.16}{12}\right)^{12} \approx 100\,000 \cdot 1.17180 \approx \mathbf{117\,180} \quad .$$

3. $B_{\text{cont}}(1)$ ($n \rightarrow \infty$):

$$B_{\text{cont}}(1) = 100\,000 e^{0.16} \approx 100\,000 \cdot 1.17351 \approx \mathbf{117\,351} \quad .$$

Сближение дискретного роста к экспоненте при $r = 16.5\%$



$$\overbrace{116\,000}^{B_1(1)} < \overbrace{117\,180}^{B_{12}(1)} < \overbrace{117\,351}^{B_{\text{cont}}(1)}$$

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: e^r .

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, , 100 .
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: 99, 101, 98.5, 105 — , .

, , 100 .
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: 99, 101, 98.5, 105 — , .
— , — , .

$$2. \quad (\Omega, \mathcal{F}, \mathbb{P})$$

- $(\Omega, \mathcal{F}, \mathbb{P})$,
1. Ω — ();
 2. \mathcal{F} — σ - , Ω , ;
 3. \mathbb{P} — , $A \in \mathcal{F}$ $\mathbb{P}(A)$ $[0, 1]$.

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1. ():

$$\Omega = \{\text{up}, \text{down}, \text{flat}\}.$$

2. — :

$$\mathcal{F} = \sigma(\{\text{up}\}, \{\text{down}\}, \{\text{flat}\}).$$

3. :

$$P(\text{up}) = 0.3, \quad P(\text{down}) = 0.4, \quad P(\text{flat}) = 0.3.$$

$$(\Omega, \mathcal{F}, P).$$

3.

■ $\frac{1}{2} \frac{d}{dt} \left(\frac{1}{2} \frac{d}{dt} \right)$

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■ (K) — ,

- (K) — ,
- (T) — , (). T

- (K) — ,
- (T) — , (). T

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— K T ,
 S_T .

Call- — K .

- , $S_T > K$;

- , $S_T \leq K$.

Put- — K .

- , $S_T < K$;

- , $S_T \geq K$.

- Long Call: . .
- Short Call: . .
- Long Put: . .
- Short Put: . .

(!!!) : long short — , .

- Long Call: . .
- Short Call: . .
- Long Put: . .
- Short Put: . .

(!!!) : long short — ,

.

- (long) .
- (short) .

(...)

