
— -01-24

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$$(\quad) - \{B(t)\}_{t \geq 0},$$

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

$$B(0) = 1.$$

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

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

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

() $B(t)$,
 r .

- —
- —
- **Numeraire —**

$$[0, T]$$

$$\Delta t:$$

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

,

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

n

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

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

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

,

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

$$r = 16,5\% = 0.165.$$

$$(T = 1)$$

$$B(0) = 100\,000$$

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1. 1 ():

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

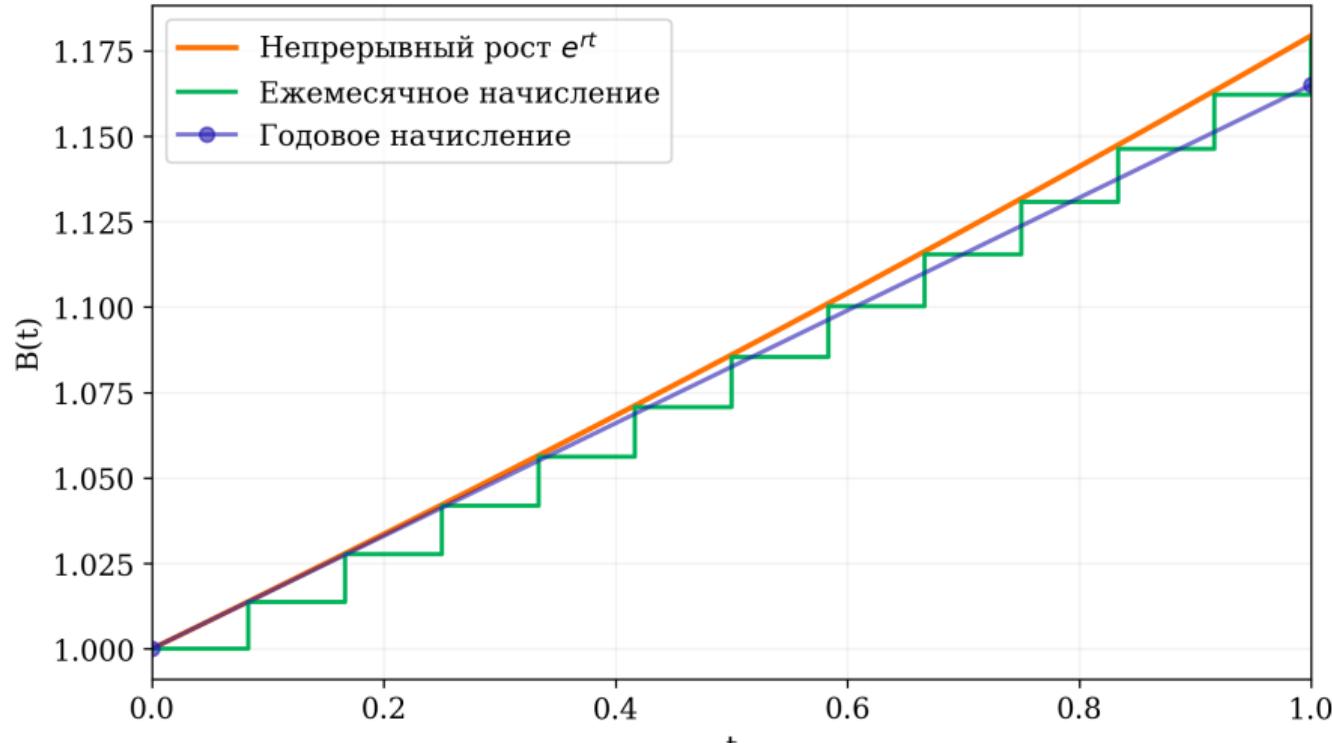
2. ($n = 12$):

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

3. ($n \rightarrow \infty$):

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

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



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

1

$\vdash e^r$

1.

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100

: 99, 101, 98.5, 105 —

, , 100 .
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: 99, 101, 98.5, 105 —

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

2.

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

()

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1. ():

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

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.

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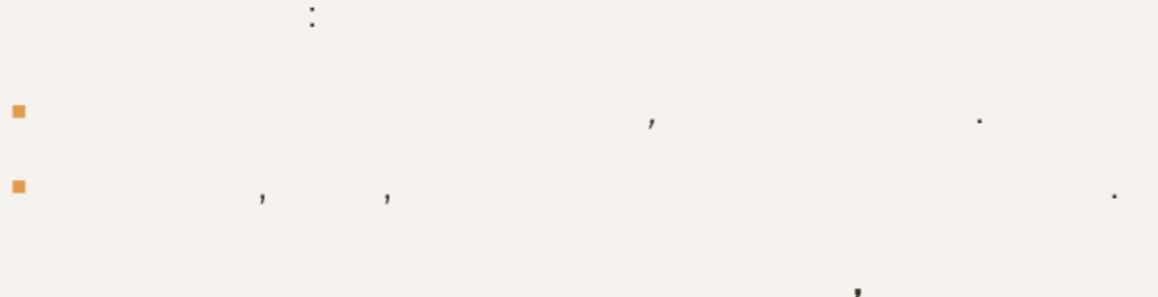
P&L.

P&L

P&L

4.

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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)

()

...

Call

Put
