LaTeX 培训课件

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自我介绍

- 2019年 美国大学生数学建模竞赛（MCM/ICM）
  - 团队主笔；
  - 在四天的时间内 使用 LaTeX (TeX Studio) 创作、排版20页的论文，获得了特等奖 Outstanding Winner .

主要内容

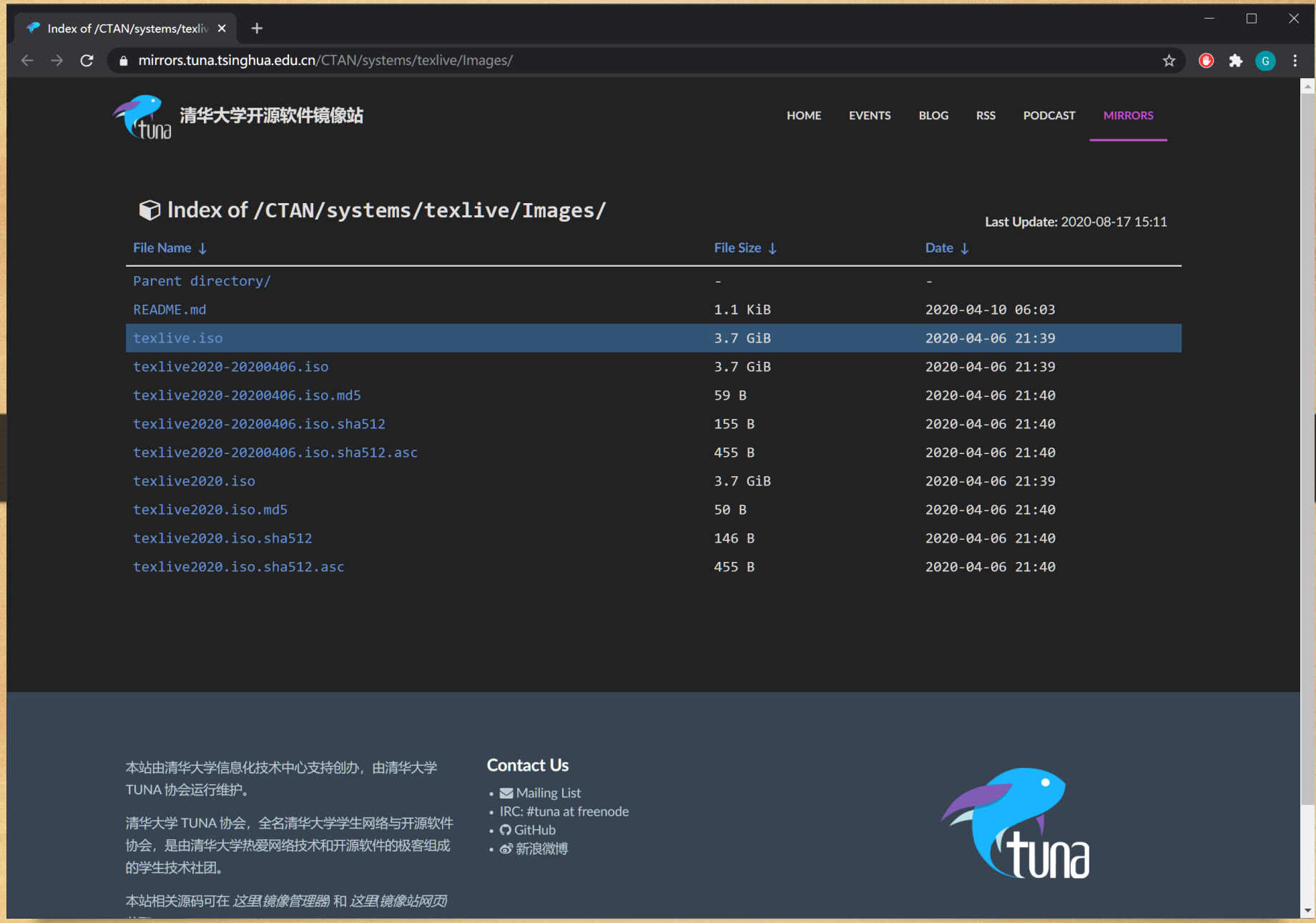
- TeX Studio 简介
- 宏，宏包，和替换指令
- 进阶插图技巧
- 常见错误解析
- LaTeX 的其他应用场景

TeX Studio 功能介绍

- 安装
- 界面
- 特性

TeX Studio 的安装

- 需要本地的TeX 环境
  - 推荐：TeX Live
  - 清华镜像 https://mirrors.tuna.tsinghua.edu.cn/CTAN/systems/texlive/Images/
- 编辑器本体
  - https://github.com/texstudio-org/texstudio/releases
  - 目前最新的是3.0 的rc版本，Mac 选 -osx.dmg; Win选 .exe 或者 win-portable.zip (硬盘版)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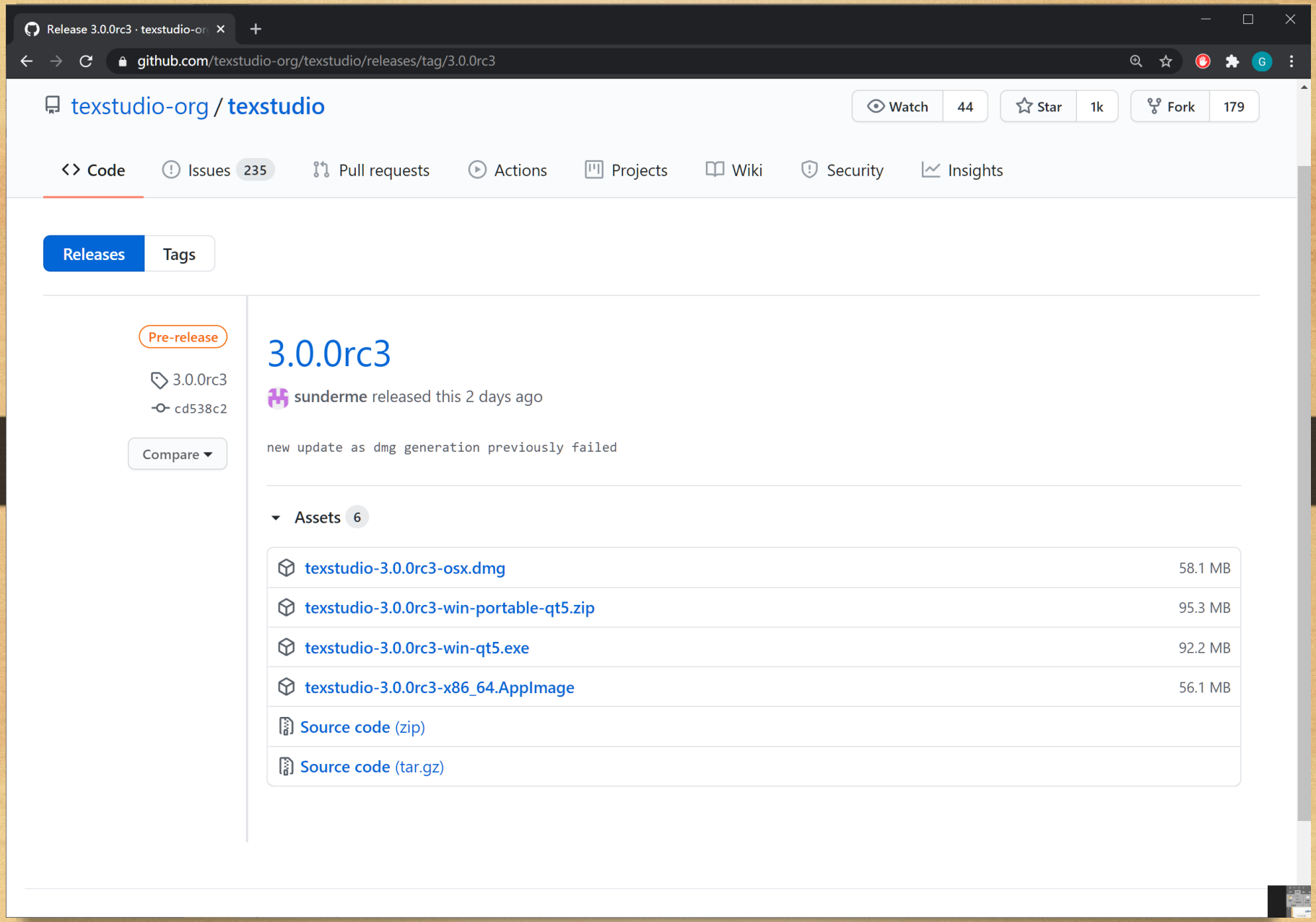
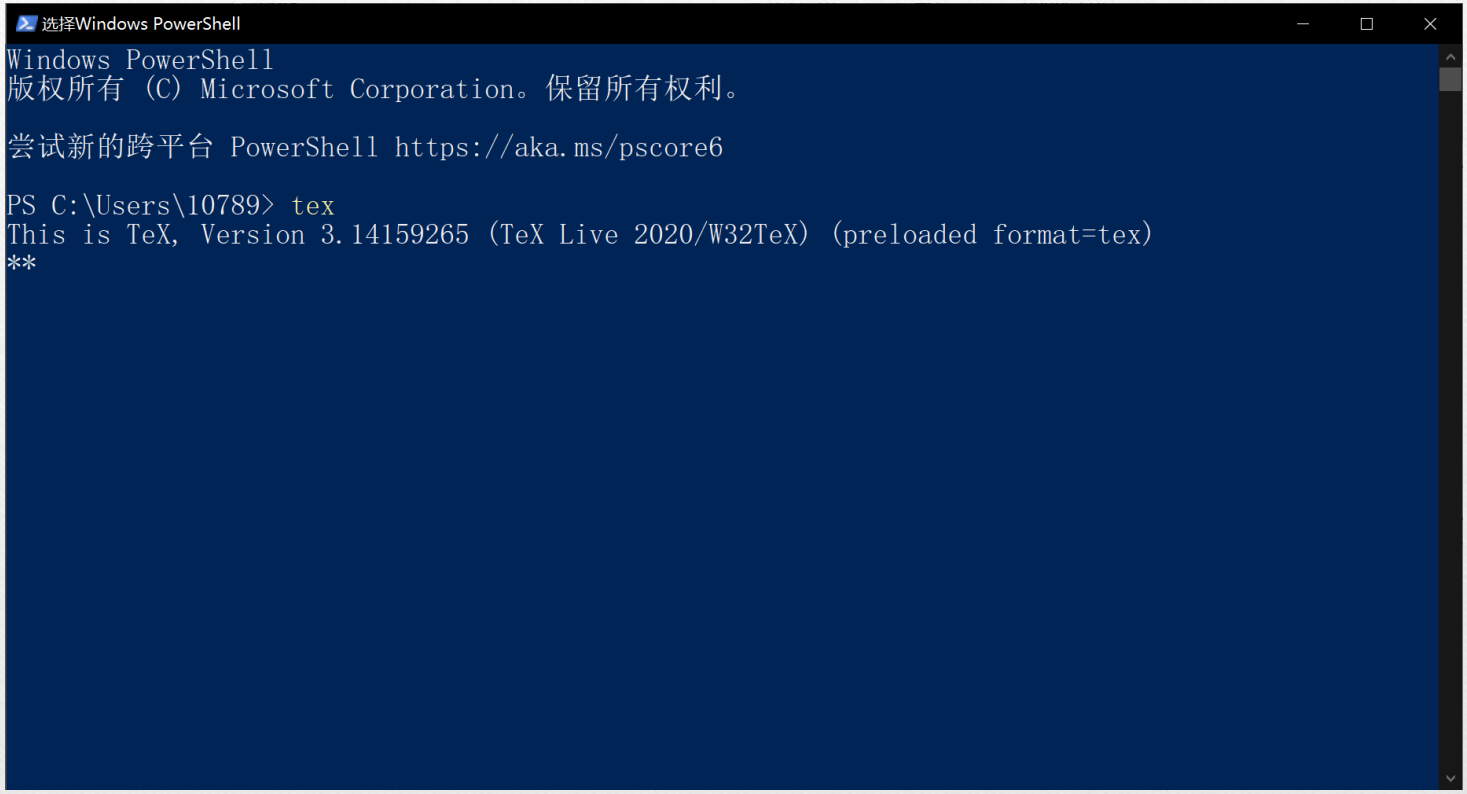
texlive2020.iso.sha512.asc 455 B 2020-04-06 21:40
本站由清华大学信息化技术中心支持创办，由清华大学 TUNA 协会运行维护。
清华大学 TUNA 协会，全名清华大学学生网络与开源软件协会，是由清华大学热爱网络技术和开源软件的极客组成的学生技术社团。
本站相关源码可在 这里(镜像管理器) 和 这里(镜像站网页)
Contact Us
Mailing List
IRC: #tuna at freenode
GitHub
新浪微博


Release 3.0.0rc3 · texstudio-org
github.com/texstudio-org/texstudio/releases/tag/3.0.0rc3
texstudio-org / texstudio
Watch 44
Star 1k
Fork 179
Code
Issues 235
Pull requests
Actions
Projects
Wiki
Security
Insights
Releases
Tags
Pre-release
3.0.0rc3
cd538c2
Compare
3.0.0rc3
sunderme released this 2 days ago
new update as dmg generation previously failed
Assets 6
texstudio-3.0.0rc3-osx.dmg 58.1 MB
texstudio-3.0.0rc3-win-portable-qt5.zip 95.3 MB
texstudio-3.0.0rc3-win-qt5.exe 92.2 MB
texstudio-3.0.0rc3-x86_64.AppImage 56.1 MB
Source code (zip)
Source code (tar.gz)

TeX 环境安装成功了吗



C:\Users\10789\Documents\LaTeX\Credit_Risk\PAPER.tex - TeXstudio

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Structure

- PAPER.tex
  - LABELS
  - ABSTRACT.tex
  - Methodology
    - The Affine Proces...
    - Bond Pricing
      - Government ...
      - Riskless bond...
      - Corporate bo...
      - Swap rates
- ABSTRACT.tex

PAPER.tex | ABSTRACT.tex

```
        -\lambda_{1} - \nu_1 & \lambda_{12} & \ldots & \lambda_{1, K-1} \\
        \lambda_{21} & \lambda_{2} - \nu_2& \ldots & \lambda_{2, K-1} \\
        \vdots & \ & \ddots & \vdots \\
        \lambda_{K-1,1} & \dots & \dots & -\lambda_{K-1, K-1} -
        \nu_{K-1}\\
    \end{bmatrix} \mu(\bm{X_s})
\end{equation}

According to Lando (1998) \cite{Lando_1998}, we can decompose $\tilde
{\bm{\varLambda}}^{\nu}$ into $\tilde {\bm{\varLambda}}^{\nu} = \tilde
{\bm{B}} \tilde {\bm{D}} \tilde{\bm{B}}^{-1}$. $\tilde {\bm{D}}$ is a
diagonal matrix with the eigenvalues of $\tilde {\bm{\varLambda}}^{\nu}$
and $\tilde {\bm{B}}$ us a $K-1 \times K-1 $ matrix consisting of
eigenvectors of $\tilde {\bm{\varLambda}}^{\nu}$ as columns. Define
$[\tilde{\bm{B}}^{-1}]_{j, K} = - \sum_{k=1}^{K-1}[\tilde{\bm{B}}]_{jk}$
and the price of a corporate bond with rating $i$ can be written as
\begin{equation}
    v ^ { i } ( t , T ) = \sum _ { j = 1 } ^ { K - 1 } - [ \tilde {
    \bm{B} } ] _ { i j } [ \tilde { \bm{B} } ^ { - 1 } ] _ { j , K } E _
    { t } ( \text{e}^ { \int _ { t } ^ { T } \tilde { \bm{D} } _ { j j }
    \mu ( \bm{X _ { u }} ) - r ( \bm{X _ { u }} ) d u } )
\end{equation}

The conditional expectation can be solved as:
\begin{equation}
    \begin{aligned}
        &E _ { t } ( \text{e}^ { \int _ { t } ^ { T } \tilde { D } _ { j
        j } \mu ( X _ { u } ) - r ( X _ { u } ) d u}  )\\
        &= \text{e}^ { - ( T - t ) ( a + e - \tilde { D } _ { jj } b ) }
        E _ { t } ( \text{e}^ { - \int _ { t } ^ { T } ( ( 1 - c \tilde {
        D } _ { j j } ) X _ { 1 u } + ( 1 - c \tilde { D } _ { j j } ) X
        _ { 2 u } + ( - \tilde { D } _ { j j } ) X _ { 3 u } + ( - \tilde
        { D } _ { j j } ) X _ { 4 u } + X _ { 5 u } d u ) } )\\
        &= \text{e}^ { - ( T - t ) ( a + e - \tilde { D } _ { jj } b ) }
        \prod _ { i = 1 } ^ { 2 } [ E _ { t } ( \text{e}^ { - \int _ { t
        } ^ { T } ( 1 - c \tilde { D } _ { j j } ) X _ { i u } d u } ) ]
        \prod _ { i = 3 } ^ { 4 } [ E _ { t } ( \text{e}^ { - \int _ { t
        } ^ { T } ( - \tilde { D } _ { j j } ) X _ { i u } d u}  ) ] E _
        { t } ( \text{e}^ { - \int _ { t } ^ { t } X _ { 5 u } d u } )\\
        &= \text{e}^ { - ( T - t ) ( a + e - \tilde { D } _ { jj } b ) }
```

Line: 185 Column: 146 INSERT

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Process exited normally

5 of 7

For notational reasons, we work with a generator matrix without the default states, in practice

$$\tilde{\boldsymbol{A}}_X(s) = \tilde{\boldsymbol{\Lambda}}^{\nu}\mu(\boldsymbol{X_s}) = \begin{bmatrix} -\lambda_1 - \nu_1 & \lambda_{12} & \dots & \lambda_{1,K-1} \\ \lambda_{21} & \lambda_2 - \nu_2 & \dots & \lambda_{2,K-1} \\ \vdots & & \ddots & \vdots \\ \lambda_{K-1,1} & \dots & \dots & -\lambda_{K-1,K-1} - \nu_{K-1} \end{bmatrix} \mu(\boldsymbol{X_s}) \tag{18}$$

According to Lando (1998) [2], we can decompose $\tilde{\boldsymbol{\Lambda}}^{\nu}$ into $\tilde{\boldsymbol{\Lambda}}^{\nu} = \tilde{\boldsymbol{B}}\tilde{\boldsymbol{D}}\tilde{\boldsymbol{B}}^{-1}$. $\tilde{\boldsymbol{D}}$ is a diagonal matrix with the eigenvalues of $\tilde{\boldsymbol{\Lambda}}^{\nu}$ and $\tilde{\boldsymbol{B}}$ us a $K-1 \times K-1$ matrix consisting of eigenvectors of $\tilde{\boldsymbol{\Lambda}}^{\nu}$ as columns. Define $[\tilde{\boldsymbol{B}}^{-1}]_{j,K} = -\sum_{k=1}^{K-1}[\tilde{\boldsymbol{B}}]_{jk}$ and the price of a corporate bond with rating i can be written as

$$v^i(t,T) = \sum_{j=1}^{K-1} -[\tilde{\boldsymbol{B}}]_{ij}[\tilde{\boldsymbol{B}}^{-1}]_{j,K} E_t(\mathrm{e}^{\int_t^T \tilde{D}_{jj}\mu(\boldsymbol{X_u}) - r(\boldsymbol{X_u})du}) \tag{19}$$

The conditional expectation can be solved as:

$$\begin{aligned} & E_t(\mathrm{e}^{\int_t^T \tilde{D}_{jj}\mu(X_u) - r(X_u)du}) \\ &= \mathrm{e}^{-(T-t)(a+e-\tilde{D}_{jj}b)} E_t(\mathrm{e}^{-\int_t^T((1-c\tilde{D}_{jj})X_{1u}+(1-c\tilde{D}_{jj})X_{2u}+(-\tilde{D}_{jj})X_{3u}+(-\tilde{D}_{jj})X_{4u}+X_{5u}du)}) \\ &= \mathrm{e}^{-(T-t)(a+e-\tilde{D}_{jj}b)} \prod_{i=1}^{2}[E_t(\mathrm{e}^{-\int_t^T(1-c\tilde{D}_{jj})X_{iu}du})] \prod_{i=3}^{4}[E_t(\mathrm{e}^{-\int_t^T(-\tilde{D}_{jj})X_{iu}du})] E_t(\mathrm{e}^{-\int_t^t X_{5u}du}) \\ &= \mathrm{e}^{-(T-t)(a+e-\tilde{D}_{jj}b)} \prod_{i=1}^{5}[\mathrm{e}^{A_t^j(T-t)+B_t^j(T-t)X_{it}}] \\ &= \mathrm{e}^{A^j(T-t)+\boldsymbol{B^j(T-t)'X_t}} \end{aligned} \tag{20}$$

where

$$\begin{aligned} A^j(T-t) &= -(T-t)(a+e-\tilde{D}_{jj}b) + \sum_{i=1}^{5}[A_i^j(T-t)] \\ \boldsymbol{B^j(T-t)} &= [B_1^j(T-t), \dots, B_5^j(T-t), 0] \end{aligned} \tag{21}$$

1.2.4 Swap rates

This part is reserved for swap modelling.

Pages 5 to 6 of 7 71%

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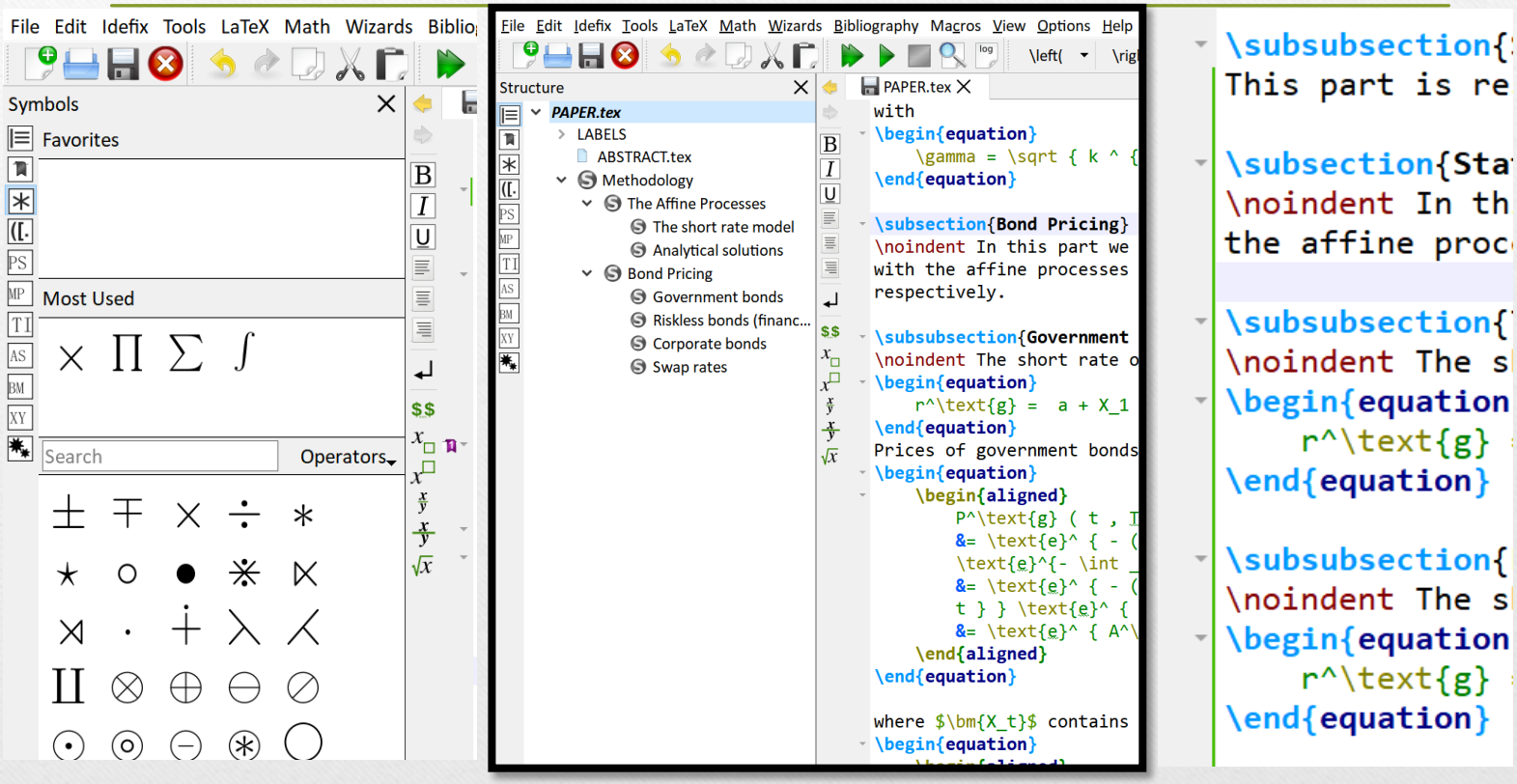
特性和功能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Methodology
The Affine Processes
The short rate model
Analytical solutions
Bond Pricing
Government bonds
Riskless bonds (financ...
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Swap rates
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\gamma = \sqrt { k ^ {
\end{equation}
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\end{equation}
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\end{equation}

宏包

- 字体包（\usepackage{palatino}）
- hyperref (\href{url}{text})
- amsmath, amssymb
- bm

新指令 (newcommand)

示例:

```
\newcommand{\tabincell}[2]{\begin
{tabular}{@{}#1@{}}#2\end{tabular}}
```

调用 → \tabincell{A...}{B...}

进阶插图技巧

- 尽可能把图片保存为.eps格式
  - Matlab, Python (matplotlib)
- 把文档转换成 .pdf 格式 然后当作图片插入
  - Word, Excel, Visio…

常见错误及解析

- 混淆全角和半角符号
- 混淆数学符号和一般字母 (\text{}) $g\ \mathrm{g}$
- 混淆希腊字母和斜体希腊字母 $\epsilon\ \mathcal{E}$
- 其他的特殊符号(e.g. \mathbb{R}) $\mathbb{R}$
- 公式加粗不能用 \textbf, 要用 \bm $\hat{\boldsymbol{z}}_t = \boldsymbol{A}_t + \boldsymbol{B}_t \hat{\boldsymbol{X}}_{t|t-1}$
- 包含多行的公式 (...) → \left(... \right) $(\frac{a^n}{b_m})\ \left(\frac{a^n}{b_m}\right)$

ν	\nu	N	N
ξ	\xi	Ξ	\Xi
o	\omicron	O	O
π	\pi	Π	\Pi
ρ	\rho	P	P
σ	\sigma	Σ	\Sigma
τ	\tau	T	T
υ	\upsilon	Υ	\Upsilon
ϕ, φ	\phi, \varphi	Φ	\Phi
χ	\chi	X	X
ψ	\psi	Ψ	\Psi

举例	命令	所需宏包
ABCdef	\mathrm{ABCdef}	
ABCdef	\mathit{ABCdef}	
$\mathcal{ABC}def$	\mathcal{ABCdef}	
$\mathscr{ABC}$def	\mathscr{ABCdef}	
$\mathfrak{ABC}\mathfrak{def}$	\mathfrak{ABCdef}	eufrak
$\mathbb{ABC}$def	\mathbb{ABCdef}	amsfonts, or amssymb

Source: https://www.cnblogs.com/xujiayi/p/10921589.html

LaTeX 的其他应用场景

- Matlab livescript (.mlx)
- Jupyter Notebook (.ipynb)

C:\Users\10789\Documents\XJTLU\Presentation.mlx

LIVE EDITOR | INSERT | VIEW

New | Open | Save | Find Files | Compare | Print — FILE
Go To | Find — NAVIGATE
Text | Normal | B I U M — TEXT
Code | Task | Control | Refactor — CODE
Section Break | Run Section | Run and Advance | Run to End — SECTION
Run | Step | Stop — RUN

```
1  disp('Hello word')
```

```
Hello word
```

```
2  1 + 2
```

```
ans = 3
```

$$v^i(t,T) = E_t^Q \exp(-\int_t^T (r(X_u) + \lambda(X_u, \eta_u)du))$$

$$\sqrt{\lambda t^2 + 2x}$$

$$\sqrt{\lambda t^2 + 2x}$$

Edit Equation

Enter LaTeX equation code:

```
v ^ { i } ( t , T ) = E _ { t } ^ { Q } \exp ( - \int _ { t } ^ { T } ( r ( X _ { u } ) + \lambda ( X _ { u } , \eta _ { u } ) d u ) )
```

Preview:

$$v^i(t,T) = E_t^Q \exp(-\int_t^T (r(X_u) + \lambda(X_u, \eta_u)du))$$

Alt Text:

Help | OK | Cancel

UTF-8 | script

Home Page - Select or create | Py_Fin_1 - Jupyter Notebook

localhost:8888/notebooks/Documents/Python%20Notebooks/Py_Fin_1.ipynb

File Edit View Insert Cell Kernel Widgets Help

Not Trusted | Python 3

```
### Markdown and LaTeX
<br>
**bold**

_italic_

**_italic_**

* first bullet
* second bullet

&ndash

<br> inserts a line break

_Log-normal Process_
$ S_T = S_0 \exp \left( \left(r - 0.5\sigma^2\right) T + \sigma \sqrt{T}
z\right)  $

**_BSM Option Pricing Formula_**

$\begin{eqnarray*}
C(S_t, K, T, r, \sigma) &=& S_t \cdot \mathbf{N}(d_1)-e^{-r(T-t)} \cdot K
 \cdot \mathbf{N}(d_2) \\
\mathbf{N}(d) &=& \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{d}e^{-\frac{1}
{2}x^2}dx\\
d_1 &=& \frac{\log \frac{S_t}{K} + (r + \frac{\sigma^2}{2})(T-t)} {\sigma
\sqrt{T-t}}\\
d_2 &=& \frac{\log \frac{S_t}{K} + (r - \frac{\sigma^2}{2})(T-t)} {\sigma
\sqrt{T-t}}\\
\end{eqnarray*}$
```

```
$$
x_{(22)}^{(n)}\qquad
\frac{1}{1+\frac{1}{2}}\qquad
\sqrt{1+\sqrt[p]{1+a^2}}\qquad
\int_1^\infty\qquad
```

Markdown and LaTeX

bold

italic

italic

- first bullet
- second bullet

&ndash

inserts a line break

Log-normal Process $S_T = S_0 \exp\left(\left(r - 0.5\sigma^2\right) T + \sigma\sqrt{T}z\right)$

BSM Option Pricing Formula

$$C(S_t, K, T, r, \sigma) = S_t \cdot \mathbf{N}(d_1) - e^{-r(T-t)} \cdot K \cdot \mathbf{N}(d_2)$$

$$\mathbf{N}(d) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{d} e^{-\frac{1}{2}x^2}dx$$

$$d_1 = \frac{\log \frac{S_t}{K} + (r + \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{T-t}}$$

$$d_2 = \frac{\log \frac{S_t}{K} + (r - \frac{\sigma^2}{2})(T-t)}{\sigma\sqrt{T-t}}$$

$$x_{(22)}^{(n)} \qquad \frac{1}{1+\frac{1}{2}} \qquad \sqrt{1+\sqrt[p]{1+a^2}} \qquad \int_1^\infty \qquad \sum_{k=1}^{n}\frac{1}{k}$$

$$\int_a^b f(x)dx \qquad \frac{\partial E_w}{\partial w} \qquad \lim_{1\to\infty} \qquad <>\leq\geq\neq\not<\not\neq$$

$$\times \div \pm \mp x \cdot y \qquad \cup\cap\setminus \subset\subseteq\subsetneq\supset\in\notin \varnothing\emptyset \qquad \to\to\leftarrow\Rightarrow\Leftarrow\mapsto$$

$$\wedge \vee \neg\forall\exists\top\bot \vdash\models \qquad \star * \oplus \circ \bullet \qquad \approx\sim\cong\equiv\prec \qquad \infty\aleph\nabla\partial \qquad \epsilon\in$$

$$\phi\varphi \qquad \left\{\sum_{i=0}^{n} i^2 = \frac{(n^2+n)(2n+1)}{6}\right\} \qquad \left(\sum_{k=\frac{1}{2}}^{N^2}\frac{1}{k}\right)$$

$$\left.\frac{\partial f(x,y)}{\partial x}\right|_{x=0} \qquad \begin{Bmatrix} a \\ a \\ a \end{Bmatrix} \qquad \begin{cases} a_1x + b_1y + c_1z = d_1 + e_1 \\ a_2x + b_2y = d_2 \\ a_3x + b_3y + c_3z = d_3 \end{cases}$$

$$f(n)\begin{cases} n/2 & if\ n > 10 \\ n+1 & if\ n = 10 \end{cases}$$

The End