Institute
and Faculty
of Actuaries

风险仪表盘 - R Shiny应用
（以偿二代为例）

周瀚哲
奥纬金融策略咨询

12 May 2015

Agenda

- **背景介绍**:
    - **什么是**偿二代？
    - **什么是**风险仪表盘？
    - **什么是** R Shiny？

- 设计**整合** :
    - 系统的设计
    - 仪表盘的设计
    - **RStudio**环境下的编程

- **改革益**处 :
    - 现**有方法的弊端**
    - 资讯传递（**及其意**义）
    - 总结

- 问答环节

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背景介绍

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Setting the scene 背景介绍

2. 风险仪表盘
新颖实用的风险报告模式

偿二代
中国新一代偿付能力监管
制度体系

3. R Shiny
基于R语言的交互网页应用拓展包
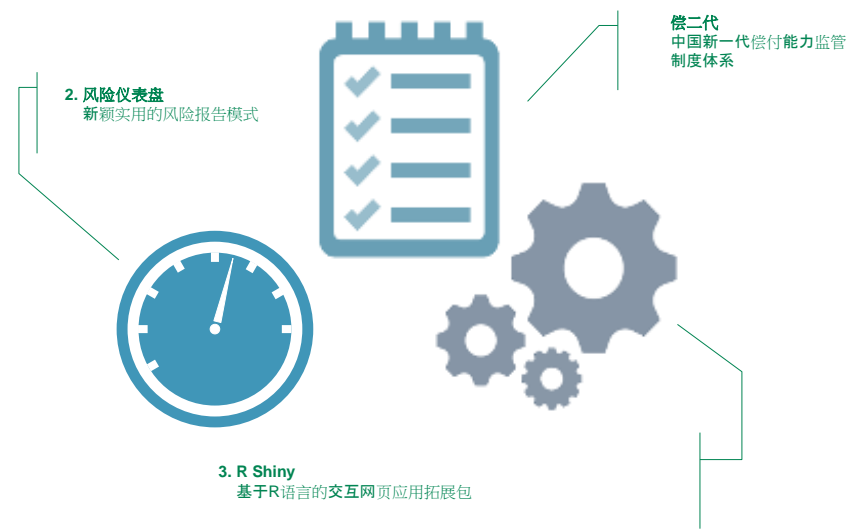
What is C-ROSS? 什么是偿二代？

Overall framework of C-ROSS 偿二代的整体框架

Unified supervision
统一监管

Emerging market 新兴市场

Risk-oriented and Value-based 风险导向兼顾价值

Pillar 1 - Quantitative capital requirements
第一支柱 - 定量资本要求
- Quantitative capital requirements 量化资本要求
- Actual capital assessment standards & capital classifications 实际资本评估标准及资本分级
- Supervision measures 监管措施

Pillar 2 - Qualitative supervision requirements
第二支柱 - 定性监管要求
- Integrated Risk Rating 风险综合评级
- Solvency Aligned Risk Management Requirements and Assessment 保险公司风险管理要求与评估
- Supervision check and measurements 监管检查和分析

Pillar 3 - Market discipline mechanism
第三支柱 - 市场约束机制
- Improve risk disclosure 加强风险披露
- Transparency 信息透明度
- Develop market disciplinary mechanism and optimize the market environment 建立市场约束机制，优化市场环境

Company's solvency management 公司偿付能力管理

① System features 制度特征

② Supervision elements 监管要素

③ Supervision basis 监管基础

Source: "Overall Framework of the Second-Generation Solvency Supervision System of China" by CIRC
来源：中国保监会 《中国第二代偿付能力监管制度体系整体框架》

C-ROSS: Pillar One 偿二代: 第一支柱

Total Required Capital 最低资本

- Market 市场
  - Interest Rates 利率
  - Equity 股票
  - …
  - Real Estate 不动产
- Credit 信用
  - Spreads 信用利差
  - Defaults 违约
- Life 寿险
  - Mortality & Morbidity 死亡率及疾病率
    - Projected Mortality 预期死亡率
    - Pandemic Mortality 大流行病死亡率
    - …
    - Morbidity 疾病率
  - Surrenders 退保率
    - Projected Surrender 预期退保率
    - Mass Surrender 大规模退保率
  - Expense 费用
- Non-Life 非寿险
  - Catastrophe 巨灾
    - Typhoon 台风
    - Earthquake 地震
  - Premium & Reserve 保费及准备金
    - Property 财产险
      - Premium 保费 / Reserve 准备金
    - Auto 车险
      - Premium / Reserve
    - …
    - Agricultural 农业险
      - Premium / Reserve

What is a Dashboard? 什么是仪表盘？

Communicates information succinctly 描述简洁的信息	→	make it simple 简明
Delivers pertinent information 传递有价值的信息	→	but not too simple 详细
Uses knowledge of human perception 人性化	→	make it visual 直观
Displays deeper information on demand 按需提供深层拓展信息	→	drill-down capability 具备深入分析空间

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(Risk) Dashboards – examples
风险仪表盘 – 实例1

All investments / cash in one place 投资和现金一体化显示

Why this position? 投资组合的原因？

Bright colours, big fonts 颜色鲜艳 字体鲜明

Relative importance? Pie charts? 相对重要性？饼图？

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(Risk) Dashboards – examples
风险仪表盘 – 实例2，3

👎 Too much information
信息冗余
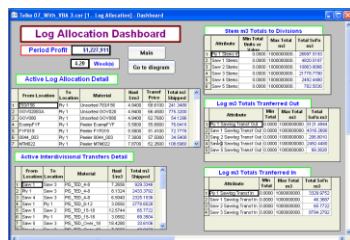
👎 Not visual enough
视觉效果匮乏

Managers of differing seniority have different needs
不同级别的管理人员有不同的需求

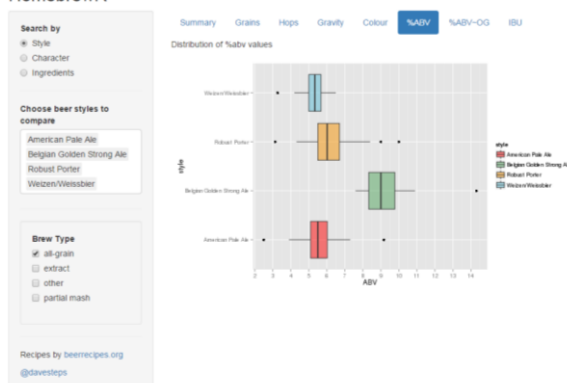**Risk reporting hierarchy model**
风险报告层次模型

Reporting hierarchy
报告层次架构

Enterprise overview
集团概况

Risk type and BU overview
风险种类及子公司概况

Risk type and BU specifics
风险种类及子公司细则

Position and exposure drill-down
投资仓位及风险暴露的深入分析

Board 董事会	Executive management level 高级行政管理层	BU management level 子公司管理层
Report 报告	Executive summary 行政摘要	
Appendix 附录	Report 报告	Executive summary 行政摘要
	Appendix 附录	Report 报告
		Appendix 附录

What is R Shiny? 什么是 R Shiny

HomebrewR

http://www.davesteps.com/homebrewR/

- Web interface for R
  R的网页应用框架

- Designed to deliver small apps
  专用于小型程序设计

- Simple rules based layout structures
  以简单规则为基础的布局结构

- Built as part of the RStudio suite
  RStudio程序包的一部分

- Uses CSS / Node.js under the hood
  可用CSS / Node.js灵活编写
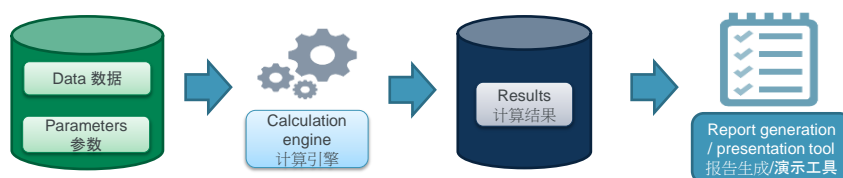
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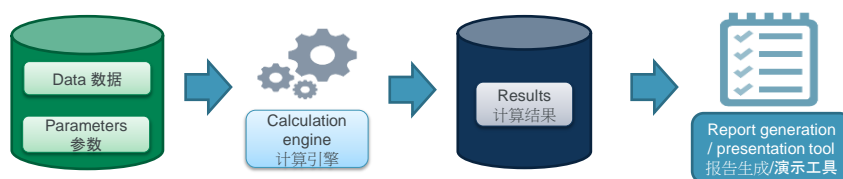and Faculty
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Putting it together
设计整合

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Schematic of a management information system 管理信息系统流程

Schematic of a management information system 管理信息系统流程 – Demo 示例

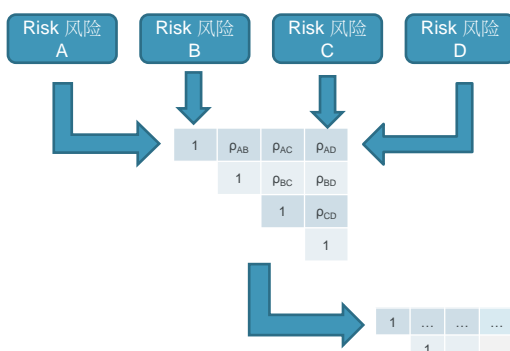| Files | R Package | Memory | R Shiny |
| 文件 | R 程序包 | 内存 | |

Designing your C-ROSS calculations
C-ROSS 计算流程

Risk 风险 A	Risk 风险 B	Risk 风险 C	Risk 风险 D

1	ρ_{AB}	ρ_{AC}	ρ_{AD}
	1	ρ_{BC}	ρ_{BD}
		1	ρ_{CD}
			1

1	…	…	…
	1	…	…

Risk X = E x RF 单一风险

$$= E \times RF_0(1 + k_1 \ldots k_n)$$

Table lookups 表格查询

Aggregation = VCV 风险合并

Matrix Multiplication 矩阵相乘

Other required features 其它需求
- Hierarchy data structure
  层次数据结构
- Node walking 节点行走
- I / O 输入/输出

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Designing your dashboard: 仪表盘设计
Brainstorm some ideas   - 头脑风暴

- Solvency margin (current, recent) 偿付能力充足率
- Integrated Risk Rating 风险综合评级   ① 1

- Required capital vs Available capital 偿付能力评估
- Available capital by tier 实际资本详情
- Required capital by risk 各类风险的**最低**资本   ② 2
- Required capital by BU 各子公司的**最低**资本

- Asset mix 资产组合
- Exposures by BU / geography 各子公司/地区的风险暴露   ③ 3
- Situation under stress scenarios 压力测试   ④ 4
- Market indicators 市场指标   ⑤ 5
- Narrative / action log 叙述性信息 / 操作日志   ⑥ 6

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Developing code in RStudio
Rstudio的代码环境优势

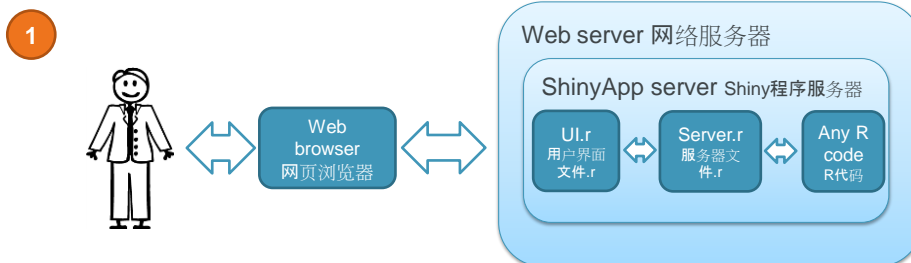| Issue with R alone 仅用R会导致的问题	Solution with RStudio Rstudio提供的解决办法
No IDE 无集成开发环境	Visual debugger (break, watch, step over, etc) 可视化调试器（强制停止，跟踪，单步执行等）
No version control 无版本控制	Integrated version control with Git and GitHub (and SVN) 与Git，GitHub（及SVN）集成的版本控制
Difficult to check / test code and difficult to apply the encapsulation principle 难以检查或测试代码并应用封装原则	Accessible development of packages, including testing 可直接应用的开发包，支持代码测试

R Studio®

Some issues remain:
依然存在的问题:
- Obscure syntax 复杂的语法
- Run times 运行时间
- Open source 开源

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R Shiny – the basics
R Shiny的基础

1

Web browser
网页浏览器

Web server 网络服务器

ShinyApp server Shiny程序服务器

UI.r
用户界面文件.r

Server.r
服务器文件.r

Any R code
R代码

2

Reactivity 信息反馈

Input 输入 | X

Output 输出 | Y

$Y = f(X)$

When user changes X, Shiny recalculates f() and updates Y
当X值变化时，R Shiny会重新计算Y值

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Package shinydashboard
Shinydashboard 开发包
UI.r 用户界面文件.r

```
library(shiny)
library(shinydashboard)

dashboardPage(
  dashboardHeader(title = "Old Faithful Geyser Data"),
  dashboardSidebar(),
  dashboardBody(
    fluidRow(
      box(
        sliderInput("bins", "Number of bins:", min = 1, max =
50,
                    value = 30)
      ),
      box(
        plotOutput("distPlot")
))))
```

Load up the new library
加载新的代码库

Slightly different to the standard Shiny declarations
略不同于惯例的Shiny声明

Every element needs to be in a box (unless it is already a box!) 所有的元素都应封装在代码盒子内

Package shinydashboard
Shinydashboard 开发包

Look familiar? 眼熟吗？ (这是Twitter推特的符号)

Implementing your C-ROSS dashboard
C-ROSS 仪表盘的实施

```
dashboardPage(

    dashboardHeader( … ),              Title 名称                    A

    dashboardSidebar( … ),             List tabs 标签列表            B

    dashboardBody( … )                 Lay out each tab's           C
                                       contents
)                                      各标签内容
```
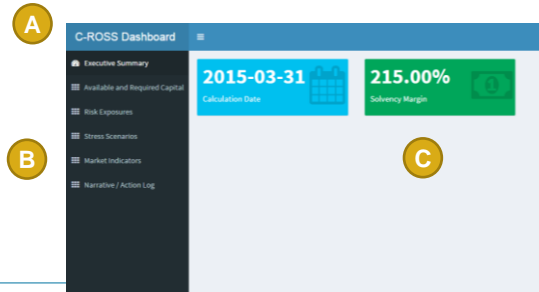

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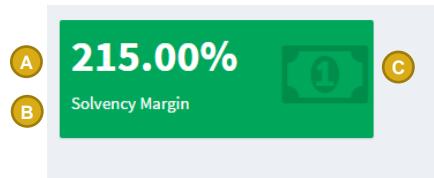

UI.r 用户界面文件.r

```
tabItems(

    tabItem( tabName = "Summary",

      fluidRow(

        valueBoxOutput( "vbxSummaryCalculationDate" ),

        valueBoxOutput( "vbxSummarySolvenyMargin" )

))
```

Server.r 服务器文件.r

```
output$vbxSummarySolvenyMargin <- renderValueBox({


    valueBox( printPercent( LatestSolvencyMargin ),      A

            "Solvency Margin",                           B

            icon= icon("money"),                         C

            color = ragColour(LatestSolvencyMargin) )


  })
```

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Available and Required Capital
实际资本及最低资本

Exposures by BU
各子公司的风险敞口

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The payoff
改革益处

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What's wrong with our current set-up?
现有方法的弊端

1. Out-dated techniques
   过时的技术

2. Bad engineering: failing to minimise operational risks
   and optimise rewarded risks
   粗糙的架构：未能最大限度地降低运营风险并有效优化有
   回报的风险

3. Poor use of resources
   不当的资源利用

Delivering insights (or, what's the point?)
资讯传递（及其意义）

To make good business decisions managers need information which is:
为做出良好的商业决策，**管理者**对获取信息的方式有如下要求：

- **presented clearly 表述明确**
- **accurate 精确性**
- **timely 时效性**

- A well designed dashboard will address the presentational issue
  一个**精心**设计的仪表盘可以解决表述方面的问题

- Accuracy is improved by using code which is tested and version controlled
  信息的精确性可以通过对代码的测试以及版本控制来提高

- Timeliness is a function of people and process – the people issue is often easier to optimise than process (e.g. data delivery times may be outside of your control)
  信息的时效性关键在于工作人员与工作流程 - **人**员方面往往比流程更易优化
  （**例如，数据**传递处理的时间也许并不可控）

Summary and conclusions 总结

C-ROSS 偿二代	A quantum leap for the Chinese insurance industry, which should improve management and customer outcomes, but which presents short-term operational, systems and education challenges **中国保**险业一次飞跃，**将有助于提高公司治理水平和**对顾客**的保障，但它同**时带来了短期操作性，**系统性和培训等方面的挑**战
Dashboards 仪表盘	A neat way of presenting pertinent information visually, and an opportunity for actuaries and insurance risk people to take advantage of insights developed in the software industry **合理利用**软件行业新发展，为精算师及保险风险专家提供简**明、直观、有价值的信息
R Shiny	A quick, powerful way of creating and delivering management information, and a welcome user interface to R **高速有效地集成及**传递管理信息方式，拥有简便的用户界面

Questions
问题?

Comments
意见?

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

欢迎各位与会人员提出宝贵问题和意见

The views expressed in this presentation are those of the presenter.

本演示文稿仅代表演示者的个人观点

Speaker Bio 演讲人简介

Phil Joubert is a principal in the Financial Services practice of Oliver Wyman, based in Hong Kong Office. Phil has fifteen years of experience in the financial services industry, having worked in areas as diverse as actuarial consulting and derivatives trading. He has worked in both Europe and Asia-Pac for a variety of insurers, banks and software houses, and specialises in risk and capital modelling and systems design

Recent experience
- Regulatory capital model design and implementation for several insurers in Europe
- Economic capital implementation for leading pan-Asian insurance group
- Derivatives trading and market risk management
- Capital aggregation systems design for leading ESG provider
- Actuarial automation implementation project for specialist life insurer

Phil holds an MSc in Finance & Mathematics from Imperial College and is a Fellow of the Faculty of Actuaries. He joined Oliver Wyman in 2014, having spent several years as an independent actuarial consultant. Previously he worked at Deutsche Bank and Natixis as a trader and he started his career with Deloitte Actuarial.

Speaker Bio 演讲人简介

周瀚哲（Phil Joubert ） 奥纬咨询公司金融服务部总监，**派驻于香港。周先生**拥有**15年金融从**业经验，**涉及**领域包括**精算咨询、金融衍生物交易等。**他曾在**欧洲和**亚洲**的保险、**银行以及软件公司**工作**过，**是**风险和资本建模以及系统设计等领域的专家。

近期贡献
- 为欧洲某些保险公司设计并建立了监管资本模型
- 为某泛亚洲顶尖保险集团建立了经济资本模型
- **衍生品交易和市**场风险管理
- 为某主要ESG（经济情景发生器）**供**应商设计了资本合并系统
- 为某专业人寿保险公司落实了精算自动化

周先生持有**英国精算**师协会精算师资格，**并**获得伦敦帝国理工学院的金融和数学双硕士**学位。**他的职业生涯开始于德勤咨询公司的精算部门。**之后，**他曾**先后**进入法国Natixis银行和**德意志**银行担任**交易**员。**此后，**他作**为独立精算顾问涉足过不少精算领域。**周先生于2014年加入奥纬**咨询公司。