

Final Review^{* †}

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June 1, 2019

^{*}This is a review lecture on financial economics 2019S taught by Xu Gao.

[†]Wish you all the best for the final exam.

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Table of Contents

- 1 Introduction
- 2 Absolute pricing
- 3 Relative pricing
- 4 Financial fractions
- 5 Conclusion

前言

这份讲义的 25 讲可以大致分成五部分。第一部分包含第 1 到第 4 讲，是课程的介绍部分，意在让那些初次接触金融学的读者了解金融的基本概念。第二部分包含第 5 讲到第 12 讲，是均衡资产定价的部分，介绍了均值方差分析、CAPM、C-CAPM 等内容。第三部分包含第 13 讲到第 19 讲，是无套利定价的部分，介绍了风险中性定价、二叉树、对冲等内容。第四部分包括第 20 讲到第 24 讲，重点在于把信息不对称、有限套利、非理性等摩擦因素引入金融分析，以丰富金融理论对现实世界的解释力。第 25 讲自成一部分，站在金融理论的外部来看理论的方法论基础和应用边界。

Table of Contents

- 1 Introduction
- 2 Absolute pricing
- 3 Relative pricing
- 4 Financial fractions
- 5 Conclusion

Introduction Lecture 1-4

① Introduction to Financial Economics

- ▶ Rate of return: good assets V.S. bad assets

② Bonds

- ▶ IRR & Reinvestment Risk
- ▶ Spot Rate(r_i) & Yield to maturity(y_i) & Forward Rate($fr_{i,j}$)
- ▶ Duration

③ Stocks

- ▶ DDM & Gordon model
- ▶ Transversality Condition(TVC)
- ▶ PE ratio
- ▶ Dividend decision & Fisher Separation Theorem

Table of Contents

- 1 Introduction
- 2 Absolute pricing**
- 3 Relative pricing
- 4 Financial fractions
- 5 Conclusion

CAPM Lecture 5-7

① Preference: Mean-Variance Analysis

- ▶ ex ante & ex post
- ▶ Risk premium

② Behavior and Equilibrium

CML(efficient frontier, Two-fund separation): $E(r_i) - r_f = \frac{\sigma_i}{\sigma_M} [E(r_M) - r_f]$
SML(pricing model): $E(r_i) - r_f = \beta_i [E(r_M) - r_f]$

③ Properties: CAPM

- ▶ Determination of discount rate & Portable alpha

④ Three Questions(7.1.2)

- ▶ Steel V.S. Pharmaceutical
- ▶ It is possible that $E(r_i) < r_f$
- ▶ $E(r_i) = E(r_j), \sigma_i < \sigma_j$, investors choose which one?

C-CAPM Lecture 8-12

① Preference: Expected Utility(Lecture 8)

- ▶ Expected Utility Theorem: Rational+Continuous+Independence
- ▶ Risk aversion & Certainty equivalent
- ▶ Utility functions(HARA,CARA,CRRA)

② Behavior: Behavior under risks(Lecture 9)

- ▶ Risky Assets [Different State]
 - Proposition1: $a^* > (=, <) 0 \Leftrightarrow E(\tilde{r}) > (=, <) r_f$
 - Proposition2: $a^{*'}(w_0) > (=, <) 0 \Leftrightarrow R'_A(\cdot) < (=, >) 0$
(DARA, CARA, IARA)
 - Proposition3: $e(w_0) = (>, <) 1 \Leftrightarrow R'_R(\cdot) = (<, >) 0$
(CRRA(**Real World**), DRRA, IRRA)(Without Proof)
- ▶ Savings under risk(R_B is more risky than R_A) [Different Time]
 - Proposition4: $s_A > (=, <) s_B \Leftrightarrow P_R(sR) < (=, >) 2$

③ Equilibrium: General Equilibrium(Lecture 10-11)

▶ Property of best risk sharing:

① Consumptions of all consumers are perfectly correlated

② Consumption is only determined by aggregated risk

③ Wilson Theorem: $\frac{dc_{ks}}{de_s} = \frac{T_k(c_{ks})}{\sum_{k=1}^K T_k(c_{ks})}$

▶ Aggregated risk V.S. Idiosyncratic risk

④ Properties: C-CAPM(Lecture 12)

▶ Risk-free rate: $r_f \approx \frac{1-\delta}{\delta} + R_R \bar{g} - \frac{1}{2} R_R P_R \sigma_g^2$ (Determination)

▶ Risk premium: $E[\tilde{r}_j] - r_f = -\frac{\delta(1+r_f)}{u'(c_0)} cov(u'(\tilde{c}_1), \tilde{r}_j)$ (Covariance)

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⑤ Two puzzles

▶ Risk free rate puzzle

▶ Equity premium puzzle

• Two economic forces(time smoothing and state smoothing)

• One parameter

Table of Contents

- 1 Introduction
- 2 Absolute pricing
- 3 Relative pricing**
- 4 Financial fractions
- 5 Conclusion

APT Lecture 13

1 APT model

- ▶ $\tilde{r}_i = \alpha_i + \sum_{k=1}^K \beta_{i,k} \tilde{f}_k + \tilde{\epsilon}_i, \quad i = 1, 2, \dots, N$
- ▶ $\tilde{r}_p = \sum_{i=1}^N w_i \alpha_i + (\sum_{i=1}^N w_i \beta_{i,1}) \tilde{f}_1 + \dots + (\sum_{i=1}^N w_i \beta_{i,K}) \tilde{f}_K + \sum_{i=1}^N w_i \tilde{\epsilon}_i$
- ▶ $\lambda_k = E(\tilde{r}_{pk}) - r_f - E(\tilde{f}_k)$
- ▶ $E(\tilde{r}_i) = r_f + \sum_{k=1}^K \beta_{i,k} (\lambda_k + E(\tilde{f}_k))$ [Exercise 13.1]

2 Parameters: \tilde{f}_k $\beta_{i,k}$ $\tilde{\epsilon}_i$ \tilde{r}_{pk} λ_k

3 Application: Statistical arbitrage

NA-Pricing Lecture 14-15

1 Future & Option [Exercise 14.1]

- ▶ Forward price v.s. Expectation of spot price in the future
- ▶ Put-call Parity(European v.s American)
- ▶ Pricing idea: replicate bond/option, Risk Neutral World

[Exercise 14.2]

2 Fundamental Theorem of Asset Pricing

Complete N.A. $\Leftrightarrow \exists !\varphi$ s.t. $P_j = \sum_{s=1}^S \varphi_s x_s^j$ [Exercise 15.2]

- ▶ $P = \sum_{s=1}^S \pi_s \frac{\varphi_s}{\pi_s} x_s = \sum_{s=1}^S \pi_s m_s x_s = E(\tilde{m}\tilde{x})$
- ▶ $P = \sum_{s=1}^S \varphi_s x_s = e^{-r} \sum_{s=1}^S \frac{\varphi_s}{\sum_{k=1}^S \varphi_k} x_s^j = e^{-r} \sum_{s=1}^S q_s x_s = e^{-r} E^Q[\tilde{x}]$

[Exercise 15.1]

Multiperiod pricing(Tree Model) Lecture 16

- ❶ Dynamic complete: Long-lived asset \geq Maximum of successor node
- ❷ Law of iterated expectation
- ❸ Dynamic pricing
 - ▶ Martingale: Define $\hat{S}_t = e^{-rt} S_t$ as deflated stock price, we have
$$E_0[\hat{S}_2] = E_0[\hat{S}_1] = \hat{S}_0$$
 - ▶ $q = \frac{e^r - d}{u - d}$
 - ▶ $C_u = e^{-r}[qC_{uu} + (1 - q)C_{ud}]$, $C_d = e^{-r}[qC_{ud} + (1 - q)C_{dd}]$
 - ▶ $C_0 = e^{-2r}[q^2 C_{uu} + 2q(1 - q)C_{ud} + (1 - q)^2 C_{dd}]$
 - ▶ **Derivatives Payoff Function:** European option, American option, Floating strike lookback call option [**Exercise 16.1**], Asian option

Optimal Stopping(Bellman Equation) Lecture 17

1 Problem1

$$V(R, G) = \max\{0, \frac{R}{R+G}[1+V(R-1, G)] + \frac{G}{G+R}[-1+V(R, G-1)]\}$$

2 Problem2

$$P = \max\{\max\{K - S, 0\}, \frac{1}{1+r}[qP_u + (1-q)P_d]\}$$

3 Problem3

$$V_s =$$

$$\min\{B_t, \frac{1}{1+r_s}[q(\bar{r}B_t + B_t - B_{t+1} + V_{su}) + (1-q)(\bar{r}B_t + B_t - B_{t+1} + V_{sd})]\}$$

[Exercise 17.2]

BS Equation(Continuous time) Lecture 18

1 Concepts

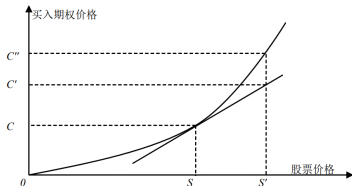
- ▶ Random Walk, Brownian motion, Wiener Process
- ▶ Ito's Lemma
- ▶ geometric Brownian motion(Assets price)

2 BS equation(European Option)

- ▶ $C_0 = S_0 N(d_1) - e^{-rT} K N(d_2)$
- ▶ $P_0 = -S_0 N(-d_1) + e^{-rT} K N(-d_2)$
- ▶ Put-Call Parity(Verify) $P_0 + S_0 = C_0 + K e^{-rT}$
- ▶ Intuition: $S_0 N(d_1), N(d_2)$

Dynamic Hedging Lecture 19

- ❶ Naked position & Covered position, Stop loss strategy
- ❷ Delta Hedge: $\Delta = \frac{\partial \Pi}{\partial S}$
- ❸ Greeks [**Exercise 19.1**]
 - ▶ Gamma: $\Gamma = \frac{\partial \Delta}{\partial S} = \frac{\partial^2 \Pi}{\partial S^2}$. Curvature & Hedging error
 - ▶ Vega: $\nu = \frac{\partial \Pi}{\partial \sigma}$



- ❹ Portfolio Insurance: replicate option [**Exercise 19.2**]

* Δ is the position, not flow

Table of Contents

- 1 Introduction
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Asymmetric Information Lecture 20-21

- ❶ Moral Hazard(ex-ante): Credit rationing
 - ▶ IC constraint & IR constraint [**Exercise 20.1**]
 - ▶ Application: Financial Accelerator, Debt Overhang, Debt-deflation, Fiscal & Monetary Policy
- ❷ Adverse Selection(ex-post): Capital Structure
 - ▶ MM Theory & Tradeoff Theory
 - ▶ Pecking Order Theory
 - Information Intensity: Low \rightarrow High
 - Internal Financing, External Financing(Debt, Equity)

Maturity Mismatch Lecture 22

❶ Moral Hazard(ex-ante): Credit rationing

❷ DD Model [**Exercise 22.2**]

- ▶ Autarky(ATK)
- ▶ Market (MKT, Open in period 1)
- ▶ Central Planner(BST)
- ▶ Bank(BNK)

❸ Bank

- ▶ Maturity Transformation(Cash Pool)
- ▶ Bank Run(Self-fulfilling) & Deposit Insurance
- ▶ Morale Hazard & Regulation
- ▶ Shadow Banking
- ▶ Internet Finance [**Exercise 22.1**]

Behavioral Finance Lecture 23

① Limits to Arbitrage

- ▶ Fundamental Risk & Implementation Costs & Noise Trader Noise

② Performance-based Arbitrage [**Exercise 23.1**]

- ▶ Performance-based → Expand market volatility

③ Systematic Bias

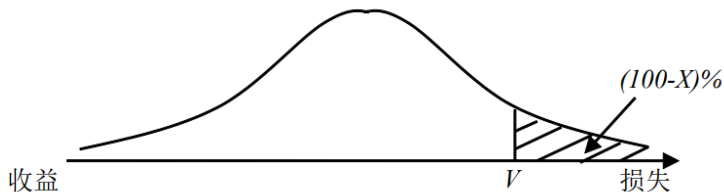
- ▶ Overconfidence & Optimism & Belief Perseverance
- ▶ Prospect Theory & Loss Aversion

④ Comments: Behavioral Finance

Financial Risk Lecture 24

① Market Risk & Credit Risk & Operation Risk

- ▶ Greeks: Delta, Gamma, Vega, Theta, Rho
- ▶ Value at Risk: $V(T, X)$



② Subprime Mortgage Crisis

- ▶ ABS & CDO
- ▶ CDS & Synthetic CDO

Table of Contents

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- 3 Relative pricing
- 4 Financial fractions
- 5 Conclusion**

Conclusion

Schedule

► <https://finaecon2019s.github.io/FinaEcon2019S/>

12	Mon, 5.6	第20讲.道德风险与信贷配给 (slides)	提取码: gtny	HW11:20.1 Due:5月13日	从本讲开始, 我们进入金融摩擦的领域 理解本讲模型设定和信贷配给理论的四个应用
12	Sat, 5.11	第21讲.逆向选择与资本结构 (slides)	提取码: 975L		理解模型的setup, 掌握信息强度与啄食假说的概念
13	Mon, 5.13	第22讲.银行与期限错配 (slides)	提取码: PY18	HW12:22.2 Due:5月20日	理解模型setup: 理解银行实现的期限转换功能, 及其对应带来的期限错配问题
14	Mon, 5.20	第23讲.行为金融学初探 (slides)	提取码: c6P1	HW13:23.1 Due:5月27日	理解模型setup, 有限套利
15	Mon, 5.27	第24讲.风险管理与次贷危机 (slides)	提取码: o4Ly		掌握相关概念, 例如风险价值度、希腊字母、CDO、CDS、合成CDO等等, 次贷危机爆发的原因
18	Mon, 6.17	期末考试			

Grades

- <https://shimo.im/sheets/uc7QXLuatNwG8UBC/MODOC>
- 平时成绩 $23 + 2^{*\dagger}$ & 期中考试 25 !!! DDL [23:00, June 16, 2019]
- 期末考试: 50 [2019 年 6 月 17 日 (周一) 18:30-20:30]

*Method1: 教材勘误, PPT 勘误

\dagger Method2: 教材答案征集 <https://www.wjx.cn/jq/11554255.aspx>

Model

NA Pricing

- 1 APT [**Exercise 13.1**]
- 2 Fundamental Theorem of Asset Pricing [**Exercise 15.2**]
- 3 Multiperiod Pricing [**Exercise 16.1**]
- 4 Optimal Stopping [**Exercise 17.2**]
- 5 Dynamic Hedging [**Exercise 19.1 & 19.2**]

Financial Frictions

- 1 Credit Rationing [**Exercise 20.1**] & Capital Structure
- 2 Diamond-Dybvig Model [**Exercise 22.2**]
- 3 Performance-based Arbitrage [**Exercise 23.1**]

End

时间：2019.06.17, 18: 30-20: 30

地点：

50-60 计算 & 40-50 简答，请务必携带计算器

May you suffer the examination and be stronger

Financial Economics 2019 Spring, Xu Gao(徐高)

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