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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Overview

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。

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Introduction Lecture 1-4

1. Introduction to Financial Economics
    - Finance: intertemporal and uncertainty
    - Asset pricing
        - Equilibrium pricing
        - No arbitrage pricing
        - Rate of return: good assets V.S. bad assets
    - Corporate finance: fractions, asymmetric information
    - Behavioral finance $\rightarrow$ Effective market

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

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CAPM Lecture 5-7

1. Preference: Mean-Variance Analysis
   - ex ante & ex post
   - Risk premium, Sharpe ratio
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: $a^{*\prime}(w_0) > 0 \Leftrightarrow R_A'(\cdot) < 0$
     - Proposition3: $e(w_0) > 1 \Leftrightarrow R_R'(\cdot) < 0$
   - Savings under risk(R_B is more risky than R_A) [Different Time]
     - Proposition4: $s_A < s_B \Leftrightarrow P_R(sR) > 2$
     - Precautionary saving V.S. Substitution effect

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
   - Representative consumer, HARA $\frac{(c-d)^{1-\gamma}}{1-\gamma}$
4. Properties: C-CAPM(Lecture 12)
   - SDF: $\tilde{m} = \delta \frac{u'(\tilde{c_1})}{u'(c_0)}, \;\; p = E(\tilde{m}\tilde{x})$
   - 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)
5. Two puzzles
   - Risk free rate puzzle
   - Equity premium puzzle
     - Two economic forces(time smoothing and state smoothing)
     - One parameter

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APT Lecture 13

1. APT model **[Exercise 13.1]**
   - CAPM $\rightarrow$ Fama-French three-factor model

     $\tilde{r_i} - r_f = \alpha_i + \beta_{i,M}(\tilde{r_M} - r_f) + \tilde{\epsilon}_i$

     $\tilde{r_i} - r_f = \alpha_i + \beta_{i,M}(\tilde{r_M} - r_f) + \beta_{i,S}\tilde{SMB} + \beta_{i,H}\tilde{HML} + \tilde{\epsilon}_i$
   - $\tilde{r_i} = \alpha_i + \sum_{k=1}^{K} \beta_{i,k}\tilde{f_k} + \tilde{\epsilon}_i, \quad i = 1, 2, \cdots, N$
   - $\tilde{r_p} = \sum_{i=1}^{N} w_i\alpha_i + (\sum_{i=1}^{N} w_i\beta_{i,1})\tilde{f_1} + \cdots + (\sum_{i=1}^{N} w_i\beta_{i,K})\tilde{f_K} + \sum_{i=1}^{N} w_i\tilde{\epsilon}_i$
   - $\lambda_k = E(\tilde{r_{pk}}) - r_f - E(\tilde{f_k})$
   - $E(\tilde{r_i}) = r_f + \sum_{k=1}^{K} \beta_{i,k}\left[\lambda_k + E(\tilde{f_k})\right] = r_f + \sum_{k=1}^{K} \beta_{i,k}\left[E(\tilde{r_{pk}}) - r_f\right]$
2. Parameters: $\tilde{f_k}$ $\beta_{i,k}$ $\tilde{\epsilon}_i$ $\tilde{r_{pk}}$ λ_k
3. Application: Portable alpha, Statistical arbitrage

NA-Pricing Lecture 14-15

1. Options & Futures [**Exercise 14.1 14.2**]
   - Forward price v.s. Expectation of spot price in the future
   - Put-call Parity(European v.s. American)
   - Options and Complete: State-index asset, butterfly spread
   - Pricing idea: replicate bond/options, Risk Neutral World
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**]
     - $P = \sum_{s=1}^{S} \pi_s \frac{\varphi_s}{\pi_s} x_s = \sum_{s=1}^{S} \pi_s m_s x_s = E(\tilde{m}\tilde{x})$
     - $P = \sum_{s=1}^{S} \varphi_s x_s = e^{-r} \sum_{s=1}^{S} \frac{\varphi_s}{\sum_{k=1}^{S} \varphi_k} x_s^j = e^{-r} \sum_{s=1}^{S} q_s x_s = e^{-r} E^Q[\tilde{x}]$
     - $P = \sum_{s=1}^{S} \pi_s \frac{\delta u'(c_{1,s})}{u'(c_0)} x_s \to q_s = \delta \pi_s \frac{u'(c_{1,s})}{u'(c_0)} / \sum_{s=1}^{S} \delta \pi_s \frac{u'(c_{1,s})}{u'(c_0)} = \frac{\pi_s u'(c_{1,s})}{\sum_{s=1}^{S} \pi_s u'(c_{1,s})}$
   - NA $\Leftrightarrow$ Risk-neutral $\Leftrightarrow$ Martingale

Multiperiod pricing(Tree Model) Lecture 16

1. Dynamic complete: Long-lived asset $\geq$ Maximum of successor node
2. Law of iterated expectation: $E_t(\tilde{x}) = E_t\big[E_{t+1}(\tilde{x})\big]$
3. Dynamic pricing
   - Martingale: Define $\hat{S}_t = e^{-rt}S_t$ as deflated stock price, we have $E_0[\hat{S}_2] = E_0[\hat{S}_1] = \hat{S}_0$ & $E_1[\hat{S}_2] = \hat{S}_1$
   - $q = \frac{e^r - d}{u-d}$
   - $C_u = e^{-r}[qC_{uu} + (1-q)C_{ud}]$, $C_d = e^{-r}[qC_{ud} + (1-q)C_{dd}]$
   - $C_0 = e^{-2r}[q^2 C_{uu} + 2q(1-q)C_{ud} + (1-q)^2 C_d d]$
   - **Derivatives Payoff Function**: European options, American options, Floating strike lookback call options [**Exercise 16.1**], Asian options

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

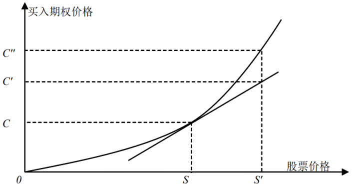
   $V_s =$
   $min\{B_t, \frac{1}{1+r_s}[q(\bar{r}B_t+B_t-B_{t+1}+V_{su})+(1-q)(\bar{r}B_t+B_t-B_{t+1}+V_{sd})]\}$
   [**Exercise 17.2**]

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) $P_0 + S_0 = C_0 + Ke^{-rT}$
   - Intuition: $S_0 N(d_1), N(d_2)$

Dynamic Hedging Lecture 19

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



4. Portfolio Insurance: replicate option[**Exercise 19.2**]

* Δ is the position, not flow

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Asymmetric Information Lecture 20-21

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

Maturity Mismatch Lecture 22

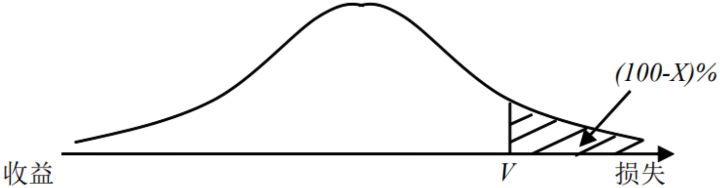
1. DD Model [**Exercise 22.2**]
   - Autarky(ATK)
   - Market (MKT, Open in period 1)
   - Central Planner(BST)
   - Bank(BNK)
2. Bank
   - Maturity Transformation(Cash Pool)
   - Bank Run(Self-fulfilling) & Deposit Insurance
   - Morale Hazard & Regulation
   - Shadow Banking
   - Internet Finance [**Exercise 22.1**]

Behavioral Finance Lecture 23

1. Limits to Arbitrage
   - Fundamental Risk & Implementation Costs & Noise Trader Risk
2. Performance-based Arbitrage [**Exercise 23.1**]
   - Performance-based $\rightarrow$ 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 ar Risk: V(T,X)



2. Subprime Mortgage Crisis
   - ABS & CDO
   - CDS & Synthetic CDO

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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，掌握信息强度与啄虚假说的概念
13	Mon,5.13	第22讲.银行与期限错配（slides）	提取码：PYt8	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：04Ly		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*† & 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

†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：理教 302（111）理教 303（110）

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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