Contents

General Notes: **2**

Reference Book . . . 2

Main elements of a model economy . . . 2

Lecture 1: Basic concepts and methods in numerical analysis **3**

Types of Error . . . 3

Solving Linear Equations . . . 3

Solving Non-Linear Equations . . . 3

Bisection . . . 3

Newton Methods . . . 3

Golden Ratio . . . 3

Lecture 2: Solving deterministic dynamic models **4**

Ramsey "Neoclassical" Growth Model . . . 4

Environment . . . 4

Planner's Problem . . . 5

Phase diagram . . . 5

How to find a numerical solution for more general u, F, θ? . . . 5

Tutorials **6**

Tutorial 1: **7**

Tutorial 2 **8**

General Notes:

70% Problem Sets - 30% Small Exam

Reference Book

Heer & Maussner - Dynamic General Equilibrium Modelling

Main elements of a model economy

- Agents
  - Households and Firms
- Goods
  - Consumption Good
  - Investment Good
- Time
  - Discreet vs continuous
- Structure of Uncertainty
  - Shocks to the economy
- Structure of Market
  - Competition vs. oligopoly vs. monopoly

Lecture 1: Basic concepts and methods in numerical analysis

Solivng problems Numerically:

- Solve the *Policy* function
- Aggregate
  - Easy for Representative Agent models
  - Harder for Heterogeneous Agent models
- Solve for prices such that markets clear

Types of Error

- Truncation
- Round Off

Solving Linear Equations

Solving Non-Linear Equations

Bisection

Newton Methods

Secant Method

Golden Ratio

Lecture 2: Solving deterministic dynamic models

Ramsey "Neoclassical" Growth Model

Environment

- Agents: A representative firm, and a representative HH.
- Time: t = 1, 2, ..., no uncertainty.
- Goods: Labour service lt , a single numeraire output good (price normalised to 1) used for consumption c_t and investment it , and a capital good Kt .
- Endowments: HH is endowed with one unit of labour each period, and initial capital k_0.
- Technology:
  - The Firm has access to a production function $F(k_t, l_t, z_t)$, including a productivity parameter zt .
  - Households have access to a capital accumulation technology: $k_{t+1} = (1?\delta)k_t + i_t$ (where it may be negative).
- Preferences: Household preferences are defined over consumption and hours U = ?? t=0 ?t u(ct , lt)
- Ownership: The HH owns the firm, receives its profits from production.
- Market structure:
  - "Sequential" trade: Every period, agents trade the numeraire good, the labor service lt (at price wt) and capital services (whose ?rental price" is rt).
  - Firm and HH behave competitively, i.e. maximise their objectives taking prices wt and r_t as given.

Planner's Problem

Simplify using assumptions.

Does a solution exist?

Well K lies in a domain.

- MPK rises at a depreciating rate
- Cost of Capital rises linearly
- the points at which they meet (0 - $\bar{F}(K^{max})$ outlines max and min)

Uniqueness

Phase diagram

Trivially, we can rule out solutions other than the steady state due to the *Transversality Condition*.

How to find a numerical solution for more general u, F, θ?

- Linearisation
- Break up the problem in separate sub-problems: *Dynamic programming*
  - Solving directly the sequences

Tutorials

Tutorial 1:

Tutorial 2

Interpolation is

$interp1(x\ vector\ of\ points\ we\ know\ , Value\ of\ the\ function\ at\ known\ points,\ \ Value\ of\ function\ at\ points\ we\ dont$