Introduction

This course is devoted to studying tools that are useful in characterizing decision rules and equilibria in economies with heterogeneous agents. Although much of modern macro is built on the representative agent paradigm, data shows that micro-economic uncertainty is an order of magnitude larger than aggregate uncertainty. It is not atypical for an individual firm to see its output expand or contract by 20-30% in a given year. Similarly, individual households are frequently affected by large shocks to their earnings: unemployment, health issues etc. In contrast, the last time the US aggregate economy activity contracted by more than 10% was during the Great Depression.

Allowing for micro-economic heterogeneity/uncertainty may alter important results derived in the context of a representative agent economy. For example:

a) Heterogeneity affects equilibrium quantities/prices. E.g., earnings uncertainty for may depress interest rates as households may find it optimal to save more than otherwise to ensure against the possibility of a streak of bad luck. Ricardian equivalence breaks down in an economy with heterogeneous households and incomplete markets. Aggregate productivity depends on the distribution of marginal tax rates faced by firms: more dispersion in tax rates typically means less aggregate productivity.

b) Heterogeneity can change answers to welfare questions. Lucas 1987: aggregate uncertainty has small welfare costs. But if different agents affected differently by the aggregate shock, welfare costs are an order of magnitude larger.

c) Some questions (social security reform, public finance) cannot be studied in the context of a representantive agent framework at all, as they are inherently about heterogeneity.

Challenges

The challenges that arise when studying economies with heterogeneous agents are:

1) characterizing agents' decision rules.

As we will see in this course, economies in which departures from the representative agent framework are economies in which decision rules are highly non-linear. We will devote a substantial part of this course studying "the income fluctuations problem," i.e.

the problem of an individual consumer whose income is subject to shocks and characterize her consumption-savings decision. We will also study the problem of a firm that faces hiring/firing costs and must decide how many workers to hire and whether to continue producing in an industry in response to productivity shocks. We will try to make as much progress with pen and paper as possible, but many interesting versions of these models are only tractable with the use of a computer. Hence we will spend a lecture or so on studying numerical tools to characterizing individual decision rules.

2) aggregating individual agents' decision rules. Once we depart from the representative agent framework, equilibria are characterized by a non-trivial endogenous distribution of, say, income and wealth (or plant productivity and capital stock) across agents. Part of our task will be to characterize this distribution: i.e., establish existence and uniqueness, as well as try to compute it. One difficulty arises when we introduce aggregate uncertainty: in this case this distribution is no longer time-invariant and we must keep track of a potentially infinite-dimensional object in order to characterize agents' decision rules. We will study a near-approximation result that deals with this problem.

Roadmap

We start by studying economies in which agents are heterogeneous and subject to individual-specific shocks, but have access to a complete set of state-contingent securities. We will derive conditions under which these economies admit **aggregation:** i.e. aggregate prices/quantities do not depend on how individual quantities are distributed across agents. In this type of economies we can still define a fictious "representative agent" for the purposes of characterizing equilibria. In other words, in these economies it makes no difference (to aggregate prices and quantities) whether all wealth is equally spread across all households, or whether 1% of the households hold 99% of the wealth.

We then drop the complete markets assumption and study an economy in which agents are subject to uninsurable income shocks. In particular, we assume that the agents can save/borrow with a non-state contingent asset that pays the same amount in all states of the world. We focus on the inidividual decision rules ('income fluctuations problem') and in particular, on the consumption-savings decision.

We then characterize equilibria in economies with incomplete markets. We discuss existence/uniqueness of an invariant distribution in an economy with no aggregate uncer-

tainty and study the role microeconomic uncertainty plays in shaping aggregate quantities. We then talk about two methodologies for allowing for aggregate risk.

We finally study a popular model of firm dynamics, Hopehayn (1992), a workhorse model widely used in modern macroeconomics and international trade, as well as in industrial organization. This is a vary useful paper as it shows how one can extend the equilibrium concept we use above to allow for endogenous entry/exit, in addition to heterogeneity in the size and growth rate of firms.