Meaning of Rational Expectations Equilibrium (REE)

- There are many definitions in the literature
- We use the following as our definition in the context of the simple new Keynesian model we have derived:
  - The households maximize their utility subject to their constraints, conditional on the true model of the economy which includes how monetary policy is conducted
  - The firms maximize their profits subject to their constraints, conditional on the true model of the economy which includes how monetary policy is conducted
  - The monetary authority follows the interest rate rule
  - The markets clear

Are Traditional Policy Evaluation Exercises Valid?

- In old times, policy analysts used to run regressions relating one variable to another without taking into account the possible dependence of the coefficients of these regression equations on the form of policy rules in place
- They would estimate the regression equation using historical data from a specific policy regime, and use this to forecast what would happen under different policy regimes
  - This is non-sense to the extent that the structure of the economy depends on the form of the policy rules (i.e., policy-invariance does not hold)
  - We cannot infer what would happen in the economy whose structure is different from the current one on the basis of the current one. This is misleading and dangerous!
- This is the insight of Robert Lucas Jr. who permanently changed the way macroeconomic analysis is conducted

Why Microfoundation?

- Microeconomics: Utility maximization, proft-maximization, cost-minimization, etc.
  - Economic agents' decisions are optimal given their constraints
- Traditional macroeconomics/macroeconometrics analyzed relationships among aggregate-level variables directly
  - If we posit that individual economic agents make decisions optimally, aggregate-level relationships should reflect this
  - Do we see this in traditional macroeconomic models such as Hicks-Hansen IS/LM model and large scale macroeconometric models a la Tinbergen and Klein? No.

Why Microfoundation?

- Let us look at the IS equation we derived in this course:

$$x_t = E_t\{x_{t+1}\} - (\frac{1}{\sigma})(\hat{R}_t - E_t\{\pi_{t+1}\} - r_t^n)$$

  - This equation embodies the representative household's optimal consumption/savings decisions because we obtained it from solving the utility maximization problem
  - We can interpret the coefficient on the real interest rate minus the natural rate as the inverse of the coefficient of relative risk aversion
  - We can even argue that the equation is quite stable
    - For instance, it would be valid under different monetary policy rules because σ is unlikely to be altered by the policy changes (i.e., σ is a deep parameter); Some researchers doubt this though (more on this in class)
- Microfoundation gives us a mapping from preference and technology to the structure of the economy which reflects optimal decisions of economic agents and is likely to be invariant across policy regimes/over time

Solving for REE

- Recall that

$$\begin{bmatrix} 1 & 0 & 0 \\ -\sigma^{-1} & 1 & \sigma^{-1} \\ 0 & 0 & \beta \end{bmatrix} \begin{bmatrix} v_t \\ E_t\{x_{t+1}\} \\ E_t\{\pi_{t+1}\} \end{bmatrix}$$

$$= \begin{bmatrix} \rho & 0 & 0 \\ 0 & 1 & \delta\sigma^{-1} \\ 0 & -\kappa & 1 \end{bmatrix} \begin{bmatrix} v_{t-1} \\ x_t \\ \pi_t \end{bmatrix} + \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \varepsilon_t$$

  describes our economy where δ is the coefficient on the inflation rate in the monetary policy rule $\hat{R}_t = \delta\pi_t + v_t$

- We solve this system for the output gap, the inflation rate, and the nominal interest rate jointly which implies that the expectations of households and firms are conditional on the policy rule in place
  - Here, we have a good understanding of how the reduced-form coefficients (which are the coefficients of the solution) are related to the deep parameters and the policy parameter. Traditional reduced-form econometric equations do not provide this luxury
- Now, it is meaningful to talk about how the economy's response to shocks, say the monetary policy shock, would change as the value of δ changes (called counter-factual policy analysis)
  - Estimates of deep parameters based on historical data are relevant here (in the absence of structural breaks in them)

Some References

- Leigh Tesfatsion's lecture notes (http://www2.econ.iastate.edu/tesfatsi/luccrit.pdf)
- Fabrice Collard's article (https://oeconomia.revues.org/2236)