SHOCKS

MARCH 30, 2009

BASICS

- **Shock / shifter**
  - **<u>Definition</u>: Some unexpected event that affects economic fundamentals and hence decisions, but which is unexplained or unexplainable**

- **Introducing shocks into our frameworks (consumption-leisure, consumption-savings, infinite-period) will "get them moving"**

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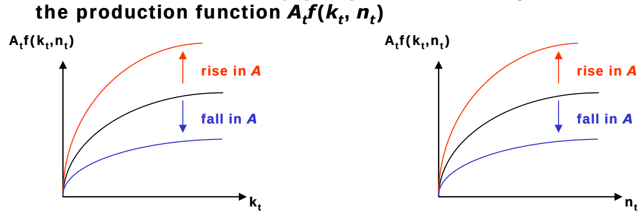

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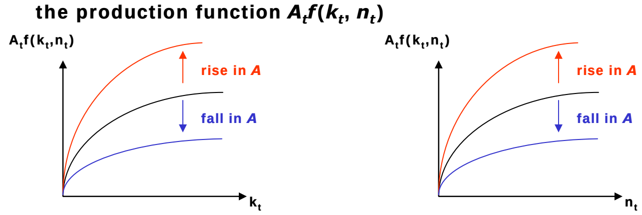

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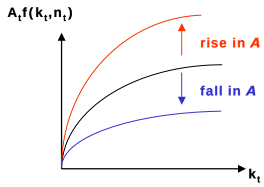

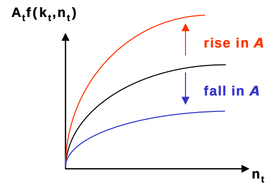

Changes in "consumer confidence"

  - **Preference Shocks – unexpected changes in representative consumer's utility function; causes rotations of indifference maps**

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"SUPPLY SHOCK"

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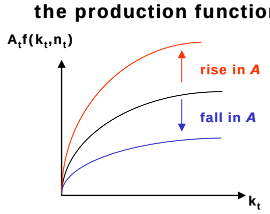

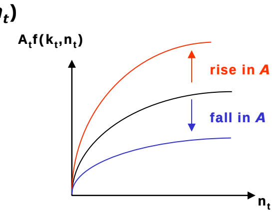

"DEMAND SHOCK"

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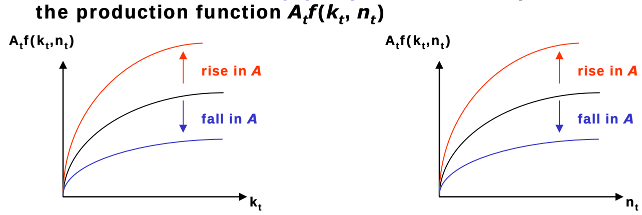
Later:
Monetary policy shocks

Later:
Financial shocks



  - **Preference Shocks – unexpected changes in representative consumer's utility function; causes rotations of indifference maps**

TFP in Cobb-Douglas Production Function

- **Revisit the commonly-used functional form in modern quantitative macroeconomic models**

$$\text{output}_t = A_t f(k_t, n_t) = A_t k_t^{\alpha} n_t^{1-\alpha}$$

- **Describes the empirical relationship between aggregate output, aggregate capital, aggregate labor, and level of sophistication of technology (TFP)**
  - **(How to measure TFP in Chapter 13)**
- **Cobb-Douglas form useful for illustrating effects of TFP shocks**

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  - Causes change in marginal product of labor

$$mpn_t = \frac{\partial \text{output}_t}{\partial n_t} = A_t f_n(k_t, n_t) = A_t (1-\alpha) k_t^{\alpha} n_t^{-\alpha}$$

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Recall ***mpn*** is foundation for labor demand

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Recall ***mpk*** is foundation for capital/investment demand

TFP Shocks and Labor Demand

- Firm-level demand for labor **defined** by the relation

$$w_t = A_t(1-\alpha)k_t^{\alpha}n_t^{-\alpha}(= mpn_t)$$

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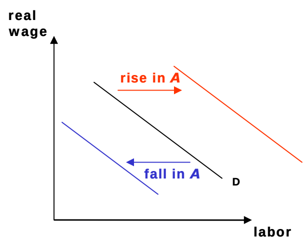
FOR GIVEN k_t and n_t, rise (fall) in A_t raises (lowers) w_t



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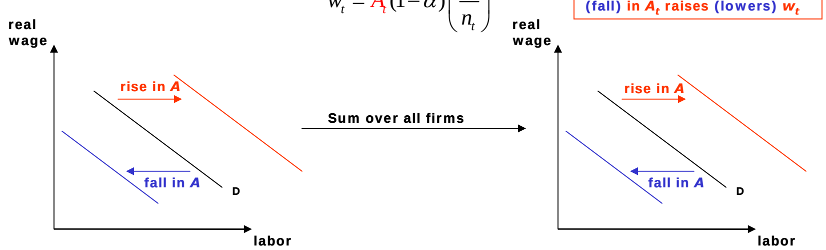

Firm-level labor demand function

Aggregate-level labor demand function

- **<u>IMPORTANT</u>: TFP shocks shift the labor demand curve**

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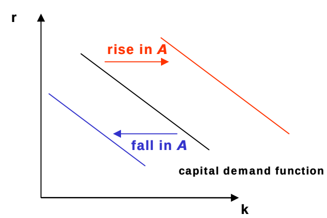

TFP Shocks and Capital / Investment Demand

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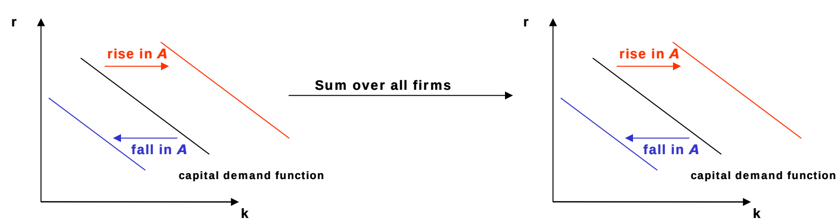

Firm-level capital demand function

Aggregate-level capital demand function

- **IMPORTANT**: TFP shocks shift the capital demand (and hence investment demand – recall $inv_t = k_{t+1} - k_t$) curve

PREFERENCE SHOCKS

- Illustrate idea using consumption-leisure model
  - Preference shocks in consumption-savings model: Practice Problem Set 5
- Utility function (modified from Chapter 2): $u(Bc, l)$
  - c: consumption
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  - B: preference shifter, with $B > 0$
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  - **"Cultural" events that alter individuals' *desires***
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Society-wide **events that alter a *given* person's desires – hence "taken as given" by an individual**

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Could interpret as the foundation of "consumer confidence"

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- **→ MRS between consumption and leisure**
  - ***B* affects MRS in "two" ways**

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The effects of *B* here affect indifference curves

The effects of *B* here cancel out (affects numerator and denominator in same way)

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Preference Shocks and Indifference Maps

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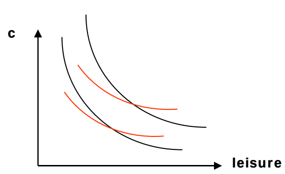
IF *B* RISES



Rise in *B* flattens all indifference curves (i.e., lowers *MRS* at any point in *c-l* space).

Interpretation: each unit of *c* more valuable, so *decreased willingness* to trade *c* for one more unit of *l*

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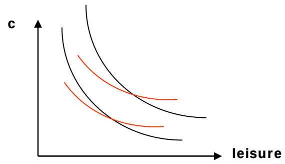

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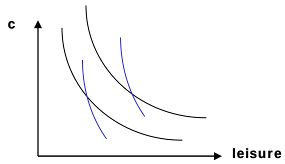

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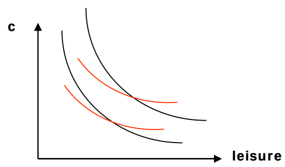

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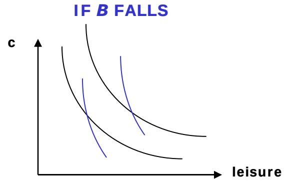
Superimpose a budget line: optimal choice of *c* and *l* clearly affected by shock to *B*

If *B* falls



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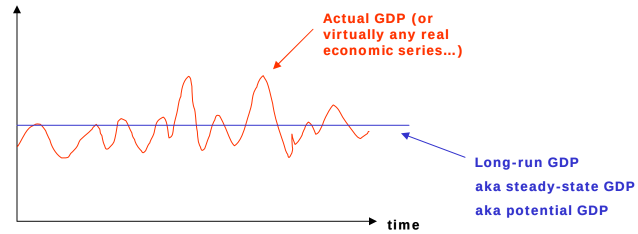
PREVIEW OF BUSINESS CYCLE THEORY

- Modern macro view: periodic ups and downs of macroeconomic activity driven fundamentally by (various and many) shocks



  - Supply shocks: TFP shocks, others
  - Demand shocks: preference shocks, monetary policy shocks (Chapter 14), others

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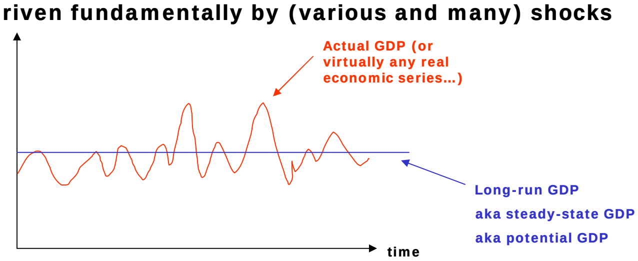

  - Supply shocks: TFP shocks, others
  - Demand shocks: preference shocks, monetary policy shocks (Chapter 14), others
- Shocks over time lead to changes over time in
  - Consumers' incentives to work, save, and consume
  - Firms' incentives to hire, invest, and produce

Economy's response(s) to shocks mediated through labor markets, capital markets, and goods markets

INTERTEMPORAL CONSUMPTION-LEISURE FRAMEWORK

MARCH 30, 2009

BASICS

- Consumption-Leisure Framework
  - Foundation for goods-market demand and labor-market supply
  - Optimality condition

$$\frac{\partial u / \partial l}{\partial u / \partial c} = (1-t)w$$

- Consumption-Savings Framework
  - Foundation for (period-t) goods-market demand and asset-market supply
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BASICS

- **Consumption-Leisure Framework**
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- **Bring together consumption-savings margin with the consumption-leisure margin**
- **Utility function: $v(c_1, l_1, c_2, l_2) = u(c_1, l_1) + u(c_2, l_2)$** (Can put a β here)
  - **Dropping the assumption from simple (Chapter 3 and 4) two-period framework that income "falls from the sky"**
  - **Representative consumer has to work for his (labor) income in *each* period**

UTILITY AND BUDGET CONSTRAINTS

- **Utility function: $v(c_1, l_1, c_2, l_2) = u(c_1, l_1) + u(c_2, l_2)$**
- **Budget constraints**
  - **Period-1 budget constraint (nominal terms)**

$$P_1 c_1 + A_1 - A_0 = iA_0 + (1-t_1)W_1(168 - l_1)$$

  - **Period-2 budget constraint (nominal terms)**

$$P_2 c_2 + A_2 - A_1 = iA_1 + (1-t_2)W_2(168 - l_2)$$

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  - **Period-2 budget constraint (nominal terms)**
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- **Derive (nominal) LBC as usual (solve P2BC for A_1 and insert in P1BC)**
  $$P_1c_1 + \frac{P_2c_2}{1+i} = (1-t_1)W_1(168-l_1) + \frac{(1-t_2)W_2(168-l_2)}{1+i} + (1+i)A_0$$

Model Structure

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  $$P_1c_1 + \frac{P_2c_2}{1+i} = (1-t_1)W_1(168-l_1) + \frac{(1-t_2)W_2(168-l_2)}{1+i} + (1+i)A_0$$
- **Or in real terms (work out details yourself)**
  $$c_1 + \frac{c_2}{1+r} = (1-t_1)w_1(168-l_1) + \frac{(1-t_2)w_2(168-l_2)}{1+r} + (1+r)a_0$$

Utility and Budget Constraints

- Utility function: $v(c_1, l_1, c_2, l_2) = u(c_1, l_1) + u(c_2, l_2)$

- Budget constraints
  - Period-1 budget constraint (nominal terms)
  $$P_1c_1 + A_1 - A_0 = iA_0 + (1-t_1)W_1(168-l_1)$$
  - Period-2 budget constraint (nominal terms)
  $$P_2c_2 + A_2 - A_1 = iA_1 + (1-t_2)W_2(168-l_2)$$
- Derive (nominal) LBC as usual (solve P2BC for A_1 and insert in P1BC)
$$P_1c_1 + \frac{P_2c_2}{1+i} = (1-t_1)W_1(168-l_1) + \frac{(1-t_2)W_2(168-l_2)}{1+i} + (1+i)A_0$$
- Or in real terms (work out details yourself)
$$c_1 + \frac{c_2}{1+r} = (1-t_1)w_1(168-l_1) + \frac{(1-t_2)w_2(168-l_2)}{1+r} + (1+r)a_0$$
- Or if infinite number of periods
$$\sum_{t=0}^{\infty}\frac{c_t}{(1+r)^t} = \sum_{t=0}^{\infty}\frac{(1-t_t)w_t(168-l_t)}{(1+r)^t} + (1+r)a_0$$
  - Assuming r is constant every period (slightly more complicated expression if r_t varies every period)

Consumption-Savings Margin

- Describes decision of how much to consume "today" (period t) versus save for "tomorrow" (period t+1)
  - A decision that spans periods

- Think of as orthogonal to (i.e., independent of) the consumption-leisure margin

- Optimal choice (two-period model) described by
$$\frac{\partial u / \partial c_1}{\partial u / \partial c_2} = 1 + r$$

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Macro Fundamentals

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  - Recall: can think of infinite-period model as sequence of overlapping two-period models

CONSUMPTION-LEISURE MARGIN

- Describes decision **within a period** of how much to consume versus how much to enjoy leisure
  - A decision that does ***not*** span periods
- Think of as orthogonal to (i.e., independent of) the consumption-savings margin
- Optimal choice (two-period model) described by

$$\frac{\partial u / \partial l_1}{\partial u / \partial c_1} = (1 - t_1) w_1 \qquad \frac{\partial u / \partial l_2}{\partial u / \partial c_2} = (1 - t_2) w_2$$

i.e., for ***each*** of the two periods

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i.e., for ***each*** of the two periods

- Optimal choice (infinite-period model) described by

$$\frac{\partial u / \partial l_t}{\partial u / \partial c_t} = (1 - t_t) w_t, \frac{\partial u / \partial l_{t+1}}{\partial u / \partial c_{t+1}} = (1 - t_{t+1}) w_{t+1}, \frac{\partial u / \partial l_{t+2}}{\partial u / \partial c_{t+2}} = (1 - t_{t+2}) w_{t+2}, \quad \text{etc.}$$

  - Consumption-leisure decision "looks the same every period" in infinite-period environment

BUILDING BLOCKS OF MODERN MACRO THEORY

- Intertemporal consumption-leisure model is the foundation of almost all modern conceptual macroeconomic frameworks
  - Referred to as Dynamic General Equilibrium (DGE) Models
  - Both Real Business Cycle (RBC) models and New Keynesian (NK) models (the two dominant current schools of macroeconomic thinking)

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- **Three seminal phases of the history of macroeconomic thought / practice**
  - **Measuring macroeconomic activity (1930's – 1950)**
  - **Keynesian-inspired macroeconometric models (1950 – 1970's)**
  - **DGE methodology (1980's – today)**