Long-run Growth Expectations and "Global Imbalances"

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Roadmap

1. Summary
2. Endowment economy
3. Production economy

Summary

The story in one graph

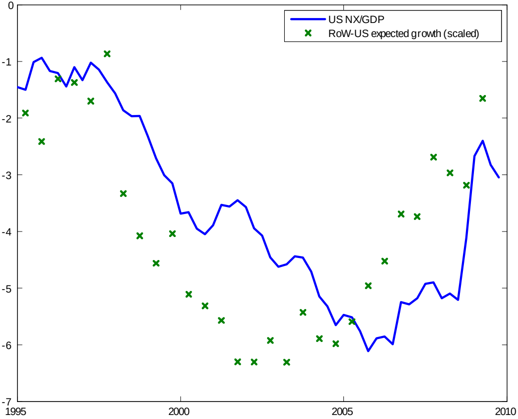


Figure 2: Consensus Forecast Growth Expectations and the Current Account

In a nutshell

Endowment economy

- Assume small open economy
- Perfect foresight
- Endowment $\boldsymbol{\omega_t}$
- Preferences $\mathbf{U = \sum \beta^t \log c_t}$
- Riskless one-period bonds traded with the r.o.w.
- Constant world interest factor $\mathbf{R}$
- BC: $\mathbf{C_t + B_{t+1} = RB_t + \omega_t}$
- Assume $\beta\mathbf{R = 1}$ and $\boldsymbol{\omega_t = \omega}$

In a nutshell
Equilibrium Allocations

- Allocations are given by ($\forall$ **t**):

$$\mathbf{c_t = c_{t+1}} \qquad \text{(Euler))}$$

$$\sum \mathbf{R^{-j} c_{t+j}} = \sum \mathbf{R^{-j}} \omega_{\mathbf{t+j}} + \mathbf{RB_t} \qquad \text{(I.B.C.)}$$

- With zero initial debt: $\mathbf{c_t} = \omega \; \forall \; \mathbf{t}$

In a nutshell

An increase in perceived future endowments

- Unexpectedly, it is announced in 0 that for $\mathbf{t} \geq \mathbf{T}$, $\omega_\mathbf{t} = (\mathbf{1} + \gamma)\omega$ with $\gamma > \mathbf{0}$.
- the I.B.C. now writes

$$\sum_{\mathbf{t}=\mathbf{0}}^{\infty} \mathbf{R}^{-\mathbf{t}} \mathbf{c_t} = \sum_{\mathbf{t}=\mathbf{0}}^{\infty} \omega_\mathbf{t}$$

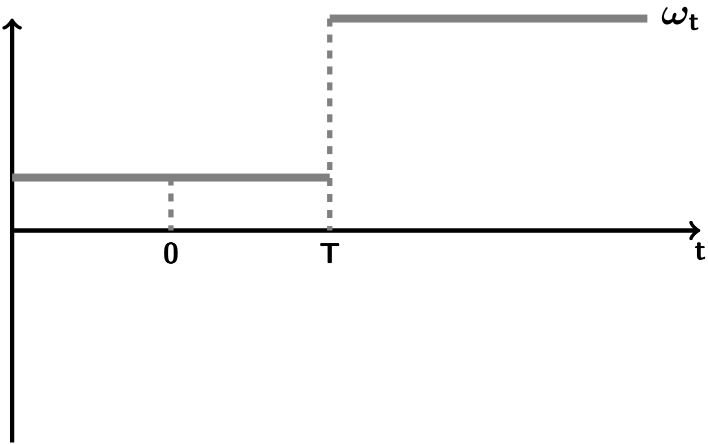
- Using the Euler equation, we obtain the new allocations

$$\mathbf{c_t} = \omega + \mathbf{R}^{-\mathbf{T}} \gamma\omega$$

- From this path, we can derive the dynamics of the current account (**B**)

In a nutshell

An increase in perceived future endowments



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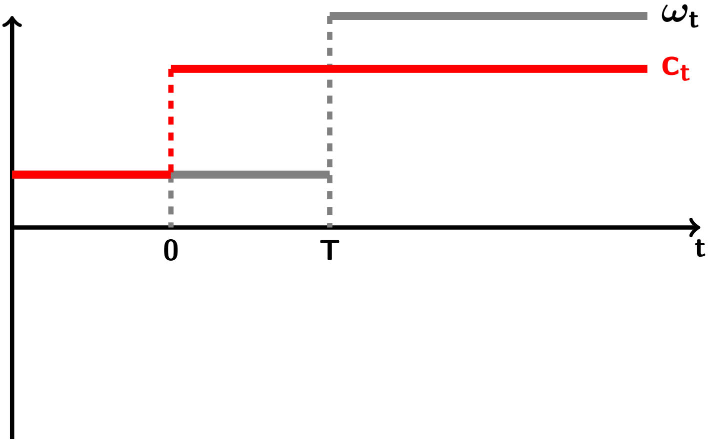
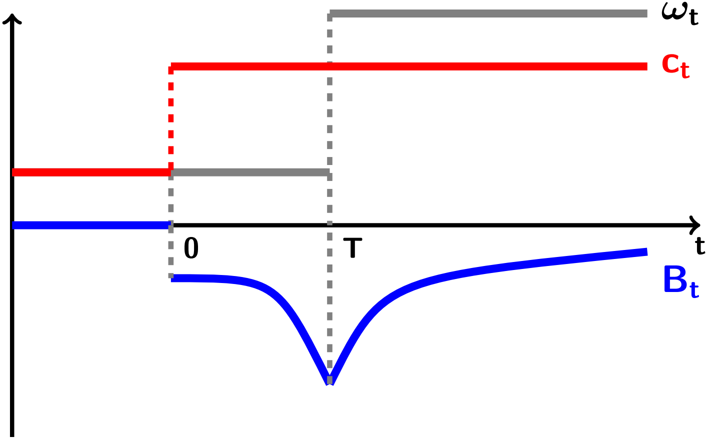


In a nutshell

An increase in perceived future endowments



Basic Idea

Endowment economy

- Home country smoothes consumption increases by borrowing abroad.
- Home country will experience a current account deficit with a boom in consumption
- Makes sense when comparing the U.S.A. with an oil-rich country
- If one considers that cheap labor is an exhaustible resource in China, it also makes sense when comparing the U.S.A. with China
- Movements of $\mathbf{C}$ and $\mathbf{B}$ are amplified if $\mathbf{dR} < \mathbf{0}$ at the same time
- Note: No need here for "correlated news" via learning

Moving to a production economy

- Things are not that easy when one considers a production economy with capital accumulation and variable labor suply
- This comes from a peculiar property of "standard" neoclassical growth model first noticed by Barro & King [1984]
- Paul Beaudry and myself have been working on this for a while

A Framework to model changes in expectations

Basic Setup

- Representative agent model
- Competitive allocations
- One sector
- Preferences $\mathbf{U(C, 1 - L) + V(I, \Omega)}$
- $\mathbf{V}$ is the expected (perceived) continuation value of investment, given an information set $\mathbf{\Omega}$
- Expectations can be rational or not, agents can learn or not, be optimistic or not, ...
- $\mathbf{V_1 > 0}$, $\mathbf{V_{11} < 0}$
- Let us assume that $\mathbf{\Omega}$ is a scalar and that $\mathbf{V_{12} > 0}$
- $\mathbf{d\Omega > 0}$ is an increase in the perceived marginal value of capital
- Budget constraint: $\mathbf{C + I = wL}$

A Framework to model changes in expectations

Basic Setup

- Technology is CRS, labor is the only input
- $\mathbf{C + I = F(L)}$

A Framework to model changes in expectations

Competitive equilibrium

$$\mathbf{wU_1 = U_2} \tag{1}$$

$$\mathbf{U_1 = V_1} \quad \text{(Euler)} \tag{2}$$

$$\mathbf{C + I = F(L) = AL} \tag{3}$$

$$\mathbf{w = A} \tag{4}$$

- Results can be generalized but I will take a parametric example with:
  - $\mathbf{U(C, 1 - L) = logC - \frac{L^{1+\gamma}}{1+\gamma}}$
  - $\mathbf{V(I, \Omega) = \Omega logI}$
  - $\mathbf{F(L) = AL}$

A Framework to model changes in expectations

Competitive equilibrium – Parametric example

$$\frac{\mathbf{A}}{\mathbf{C}} = \mathbf{L}^{\gamma} \tag{1}$$

$$\frac{\mathbf{1}}{\mathbf{C}} = \frac{\Omega}{\mathbf{I}} \tag{2}$$

$$\mathbf{C} + \mathbf{I} = \mathbf{AL} \tag{3}$$

- The equilibrium boils down to 2 equations in **C** and **L**:

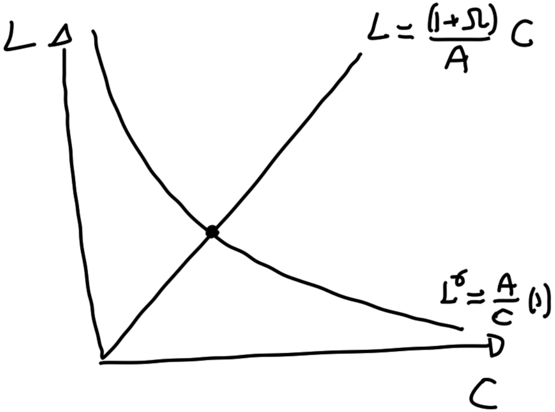
$$\frac{\mathbf{A}}{\mathbf{C}} = \mathbf{L}^{\gamma} \tag{1}$$

$$\mathbf{L} = \frac{(\mathbf{1} + \Omega)}{\mathbf{A}}\mathbf{C} \qquad \text{(2) and (3)}$$

- We also have $\mathbf{I} = \mathbf{A}\Omega(\mathbf{1} + \Omega)^{\frac{-\gamma}{1+\gamma}}$, with $\mathbf{dI}/\mathbf{d}\Omega > \mathbf{0}$

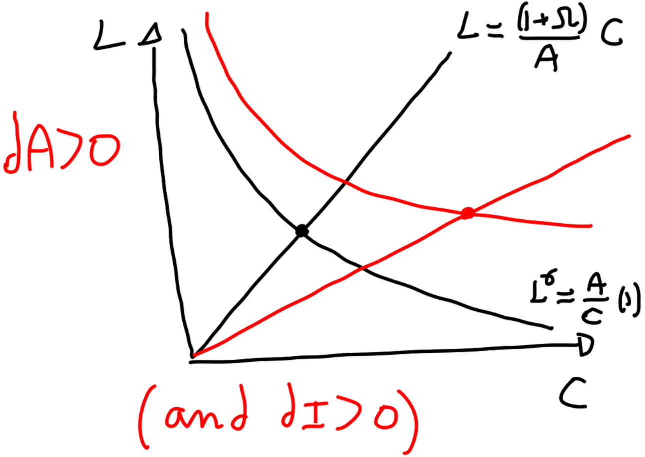
Basic Setup

Competitive equilibrium – Parametric example



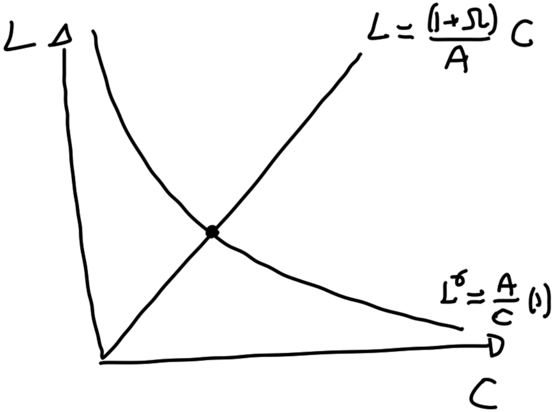
Basic Setup

A current technological shock $\mathbf{dA} > \mathbf{0}$



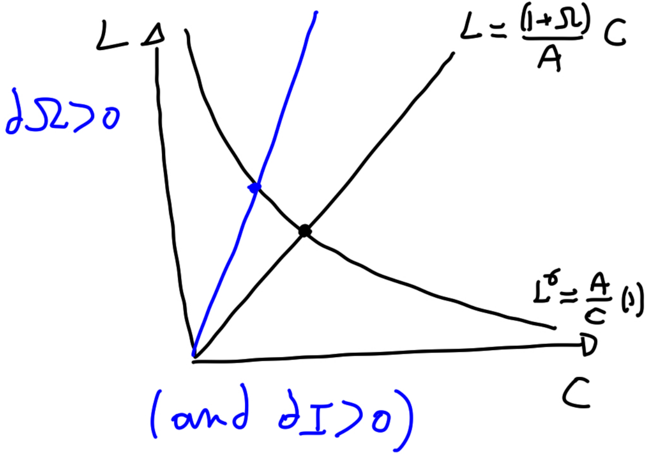
Basic Setup

Competitive equilibrium – Parametric example



Basic Setup

A Increase in the perceived value of investment $\mathbf{d\Omega > 0}$



Basic Setup

Barro-King result

- As we see it, in “standard” neoclassical models, a change in expectations cannot create an aggregate boom
- Typically, **C** on the one side and **I**, **Y** and **L** on the other side will move in opposite direction
- It is a pretty generic result
- GHH preferences do not help much (**Y** and **L** will be flat)

A Framework to model changes in expectations

GHH setup

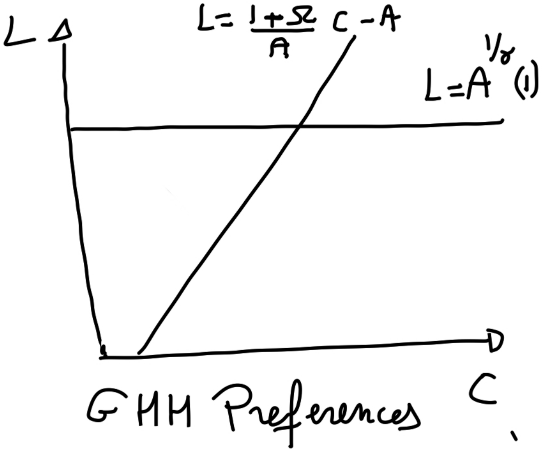
- $\mathbf{U = \log\left(C - \frac{L^{1+\gamma}}{1+\gamma}\right)}$
- Then the equilibrium is given by:

$$\mathbf{A = L^{\gamma}} \quad \textbf{(1)}$$

$$\mathbf{L = \frac{(1+\Omega)}{A}C - A} \quad \textbf{(2) and (3)}$$

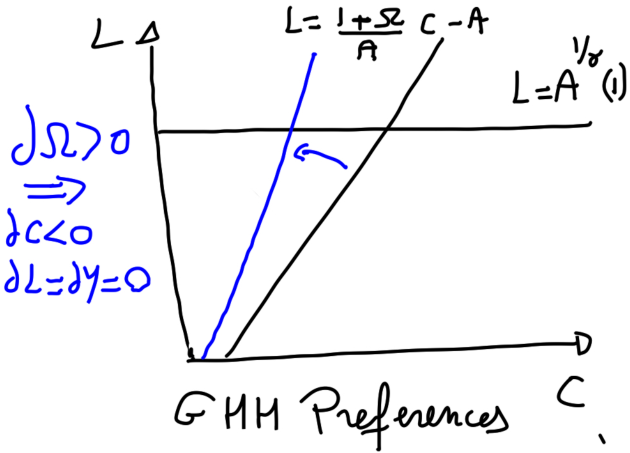
GHH Setup

Competitive equilibrium



GHH Setup

A Increase in the perceived value of investment $\mathbf{d\Omega > 0}$



Small Open Economy

- Consider a small open economy (one could easily extend to a two-country world)
- Assume now $\mathbf{U(C, 1 - L) + V(K, \Omega) + W(B)}$
- $\mathbf{W}$ defined on the real line, $\mathbf{W' < 0}$, $\mathbf{W'' < 0}$
- BC is $\mathbf{C + I + B = AL}$

Small Open Economy

Parametric example

- $\mathbf{U(C, 1-L) = logC - \frac{L^{1+\gamma}}{1+\gamma}}$
- $\mathbf{V(I, \Omega) = \Omega logI}$
- $\mathbf{W(B) = -\exp(-B)}$
- $\mathbf{F(L) = AL}$

Small Open Economy

Competitive equilibrium – Parametric example

$$\frac{\mathbf{A}}{\mathbf{C}} = \mathbf{L}^{\gamma} \tag{1}$$

$$\frac{1}{\mathbf{C}} = \frac{\Omega}{\mathbf{I}} \tag{2}$$

$$\frac{1}{\mathbf{C}} = \exp(-\mathbf{B}) \tag{2'}$$

$$\mathbf{C} + \mathbf{I} + \mathbf{B} = \mathbf{AL} \tag{3}$$

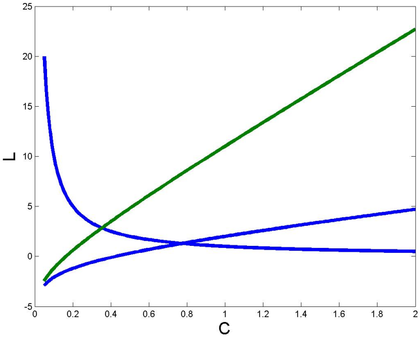
- The equilibrium boils down to 2 equations in **C** and **L**:

$$\frac{\mathbf{A}}{\mathbf{C}} = \mathbf{L}^{\gamma} \tag{1}$$

$$\mathbf{L} = \frac{(1+\Omega)}{\mathbf{A}}\mathbf{C} + \frac{\log \mathbf{C}}{\mathbf{A}} \qquad \text{(2), (2') and (3)}$$

Small Open Economy

A Increase in the perceived value of investment $\mathbf{d\Omega > 0}$



- $\mathbf{dI > 0}$, $\mathbf{dL > 0}$, $\mathbf{dB < 0}$ (current account deficit) but $\mathbf{dC < 0}$
- All signs can be reversed with different preferences, but no aggregate boom

A Solution: Adjustment costs to I

Investment is cheaper when **C** increases

- Basic assumption (lies in the very specific investment adjustment costs): $\mathbf{C} + \mathbf{q}(\mathbf{C}) \times \mathbf{I} = \mathbf{Y}$ with $\mathbf{q}' < \mathbf{0}$
- Story is (in a infinite horizon model):
  - Future high productivity $\rightsquigarrow$ **I** will be needed in the future
  - Investing today is also an investment in the investment installation technology $\rightsquigarrow$ I is cheap
- In the one sector close economy example, competitive equilibrium becomes:

$$\frac{\mathbf{A}}{\mathbf{C} + \mathbf{I}\mathbf{q}'(\mathbf{C})} = \mathbf{L}^{\gamma} \tag{1}$$

$$\frac{\Omega}{\mathbf{I}} = \frac{\mathbf{1}}{\mathbf{C}} \frac{\mathbf{q}(\mathbf{C}) + \mathbf{q}'(\mathbf{C})\mathbf{I}}{\mathbf{1} + \mathbf{q}'(\mathbf{C})\mathbf{I}} \tag{3}$$

$$\mathbf{C} + \mathbf{q}(\mathbf{C})\mathbf{I} = \mathbf{A}\mathbf{L} \tag{3}$$

- This is the model chosen by Michael & co-authors (taken from Jaimovitch-Rebelo)

A Solution: Adjustment costs to I

Investment is cheaper when **C** increases

$$\frac{\mathbf{A}}{\mathbf{C} + \mathbf{I}\mathbf{q}'(\mathbf{C})} = \mathbf{L}^{\gamma} \tag{1}$$

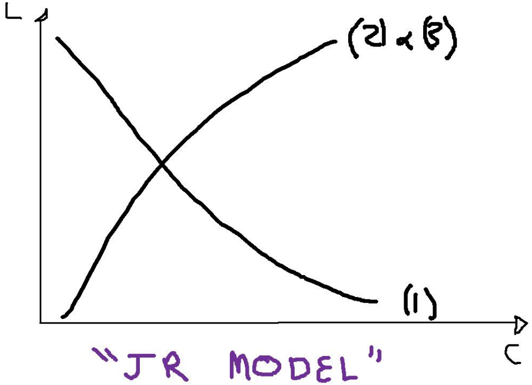
$$\frac{\mathbf{\Omega}}{\mathbf{I}} = \frac{\mathbf{1}}{\mathbf{C}} \frac{\mathbf{q}(\mathbf{C}) + \mathbf{q}'(\mathbf{C})\mathbf{I}}{\mathbf{1} + \mathbf{q}'(\mathbf{C})\mathbf{I}} \tag{2}$$

$$\mathbf{C} + \mathbf{q}(\mathbf{C})\mathbf{I} = \mathbf{A}\mathbf{L} \tag{3}$$

- Note that **I** now enters in equation (1)
- When on, boils down equation (2) and (3) to a single one, we can depict equations (1) and ((2),(3)) in the $(\mathbf{C}, \mathbf{L})$ plane and study the impact of a change in perceptions $\mathbf{\Omega}$.

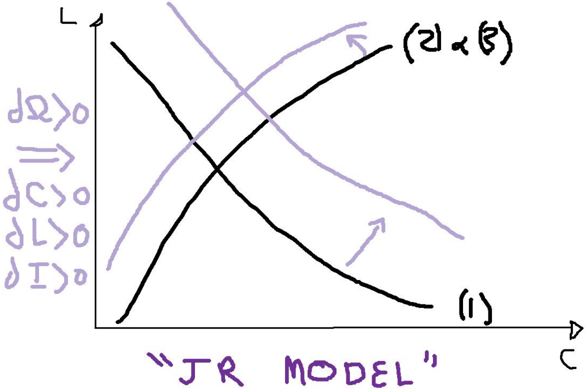
A Solution: Adjustment costs to I

Competitive equilibrium



A Solution: Adjustment costs to I

A Increase in the perceived value of investment $\mathbf{d\Omega > 0}$



A Solution: Adjustment costs to I

A solution?

- A counter intuitive and counter factual (to be discussed) implication: Investment is cheap in booms
- Other models with procyclical investment price can be constructed (with flex or sticky prices)
- I would like to see the responses of **(L**, **C** and **I** in Michael simulations

A Solution: Adjustment costs to I

A solution?

- A counter intuitive and counter factual (to be discussed) implication: Investment is cheap in booms
- Other models with procyclical investment price can be constructed (with flex or sticky prices)
- I particularly like (☺) Beaudry & Portier (2011)
- I would like to see the responses of **Y**, **L**, **C** and **I** in Michael simulations

To conclude

- Clear basic idea
- Very nice quantitative implementation - including the use of forecast surveys
- Convincing