# Chapter 2
# Dynamics of Small Open Economies

# A small open economy with many periods

- In this chapter we focus on a small economy inhabited by a representative individual with an infinite horizon
- We extend the 2-period model of chapter 1. In any given period *t* the current account is equal to the change of net foreign assets, that in turn equal to the difference between national savings and national investments

$$CA_t = B_{t+1} - B_t = Y_t + rB_t - C_t - G_t - I_t$$

- Rearranging, we obtain

$$(1 + r)B_t = C_t + G_t + I_t - Y_t + B_{t+1}$$

# A small open economy with many periods

- Iterating forward

$$(1+r)B_{t+1} = C_{t+1} + G_{t+1} + I_{t+1} - Y_{t+1} + B_{t+2}$$

- Substituting this expression of $B_{t+1}$ in the previous equation

$$(1+r)^2 B_t = (1+r)(C_t + G_t + I_t - Y_t) + C_{t+1} + G_{t+1} + I_{t+1} - Y_{t+1} + B_{t+2}$$

or

$$B_t = \frac{(C_t + G_t + I_t - Y_t)}{(1+r)} + \frac{C_{t+1} + G_{t+1} + I_{t+1} - Y_{t+1}}{(1+r)^2} + \frac{B_{t+2}}{(1+r)^2}$$

# A small open economy with many periods

- Continuing to iterate forward, we obtain

$$B_t = \frac{1}{1+r}\sum_{j=0}^{\infty}\frac{\left(C_{t+j}+G_{t+j}+I_{t+j}-Y_{t+j}\right)}{(1+r)^j}$$

$$+\lim_{T\to\infty}\frac{B_{t+T+1}}{(1+r)^{T+1}}$$

- If we impose the terminal or transversality condition $\lim_{T\to\infty}\frac{B_{t+T+1}}{(1+r)^{T+1}}=0$, we have

$$(1+r)B_t = \sum_{j=0}^{\infty}\frac{\left(C_{t+j}+G_{t+j}+I_{t+j}-Y_{t+j}\right)}{(1+r)^j}$$

# A small open economy with many periods

- This new IBC can be rewritten

$$\sum_{j=0}^{\infty} \frac{(C_{t+j} + I_{t+j})}{(1+r)^j} = \sum_{j=0}^{\infty} \frac{(Y_{t+j} - G_{t+j})}{(1+r)^j} + (1+r)B_t$$

  - This IBC states that the present value of the private sector expenditures equals the present value of income, including the return to the initial level of foreign assets $(1+r)B_t$. Remember that the government budget is balanced in each period, which means that government consumption is fully financed by taxes paid by the private sector.
  - If the initial value of assets at *t* is negative, $B_t < 0$, thus the country has initial debt position, the present value of income is reduced accordingly by the amount $(1+r)B_t$

# A small open economy with many periods

- How can we justify the tranversality condition $\lim_{T\to\infty} \frac{B_{t+T+1}}{(1+r)^{T+1}} = 0$ ?
- First consider the case in which $\lim_{T\to\infty} \frac{B_{t+T+1}}{(1+r)^{T+1}} < 0$ .
  - In this case the present value of expenditure is larger than the present value of income. The economy is continually borrowing to meet the interest payments on its foreign debt rather than transferring real resources to its creditors. The debt increases at least at the rate of interest. Foreigners will never allow such a scheme, called "Ponzi game", at their expense: that would amount to providing another economy with free resources, and they would prefer to consume these resources themselves.

# A small open economy with many periods

- Charles Ponzi in the 1920s in Boston offered high rates of return to investors by repaying his debts and interest with new debt in a bubble that eventually exploded.
- Thus, the no-Ponzi game condition is that $\lim_{T\to\infty} \frac{B_{t+T+1}}{(1+r)^{T+1}} \geq 0$
- Secondly, it cannot be optimal for the consumers in the country to set $\lim_{T\to\infty} \frac{B_{t+T+1}}{(1+r)^{T+1}} > 0$. In that case the present value of expenditure is less than the present value of income. The domestic residents are making an unrequited gift to foreigners. They could raise their lifetime utility by consuming a little more.

# A small open economy with many periods

- We can draw several results from the IBC

$$\sum_{j=0}^{\infty} \frac{\left(C_{t+j} + I_{t+j}\right)}{(1+r)^j} = \sum_{j=0}^{\infty} \frac{\left(Y_{t+j} - G_{t+j}\right)}{(1+r)^j} + (1+r)B_t$$

  - As private and government consumption cannot be negative, foreign debt is bounded from above by the market value of a claim to its entire net output: $\sum_{j=0}^{\infty} \frac{\left(Y_{t+j} - I_{t+j}\right)}{(1+r)^j}$

# A small open economy with many periods

- Assume that the country has initial foreign debt: $B_t < 0$ . If it decides to exactly spend its output in each period in each period, $Y_t = C_t + G_t + I_t$ , the dynamics of its debts is given by: $B_{t+1} = (1 + r)B_t$. If the world interest rate were negative, the foreign debt would shrink over time without payments ever made to creditors. So, the country could raise its foreign debt to very high level without minding to transfer any good to its creditors. Of course, the foreigners would refuse lending under these circumstances.
- If the interest rate was zero, under the same conditions, foreign debt would stay constant without the country making any net payment to its creditors. Still foreigners would refuse lending,
- So, the world interest rate has to be positive in equilibrium.

# A small open economy with many periods

- The consumers utility function is extended to the case of an infinity of periods as:

$$U_t = \sum_{j=0}^{\infty} \beta^j u(C_{t+j})$$

- Output on any period $t+j$ is determined by the production function $Y_{t+j} = A_{t+j}F(K_{t+j})$. We have $K_{t+j+1} = K_{t+j} + I_{t+j}$
- The economy starts out on date $t$ with predetermined stocks of capital $K_t$ and net foreign assets $B_t$

From $(1+r)B_{t+j} = C_{t+j} + G_{t+j} + I_{t+j} - Y_{t+j} + B_{t+j+1}$, we substitute the expressions of $C_{t+j}$ , $I_{t+j}$ and $Y_{t+j}$ in the expression of $U_t$

# A small open economy with many periods

$$U_t = \sum_{j=0}^{\infty} \beta^j u\left[(1+r)B_{t+j} - B_{t+j+1} + A_{t+j}F\left(K_{t+j}\right) - \left(K_{t+j+1} - K_{t+j}\right) - G_{t+j}\right]$$

The domestic residents maximize this expression with respect to $B_{t+j+1}$ and $K_{t+j+1}$. For every period $j \geq 0$, two foc conditions must hold:

- The Euler equation: $u'\left(C_{t+j}\right) = (1+r)\beta u'\left(C_{t+j+1}\right)$
- The equality between the marginal product of capital and the world interest rate: $A_{t+j+1}F'\left(K_{t+j}\right) = r$

# A small open economy with many periods

- If $\beta(1+r)=1$, we deduce from the Euler equation that consumption is stationary: $C_{t+j}=\overline{C}$ for $j\geq 0$.
- Then, we deduce from the IBC

$$\overline{C}=\frac{r}{1+r}\left\{\sum_{j=0}^{\infty}\frac{\left(Y_{t+j}-G_{t+j}-I_{t+j}\right)}{(1+r)^{j}}+(1+r)B_{t}\right\}$$

The term between accolades is the net consumers' wealth. Their consumption is equal to the annuity value of this wealth.

# Extension to the case with positive growth: when is a country bankrupt?

- From now, we will continue with a pure endowment economy (no investment and exogenous output). The more general case is developed in OR chapter 2).
- We assume that the growth rate of output, $g$, is constant and positive: $\frac{Y_{t+1}-Y_t}{Y_t} = g$
- In this context the IBC and the transversality conditions are

$$\sum_{j=0}^{\infty} \frac{C_{t+j}}{(1+r)^j} = \sum_{j=0}^{\infty} \frac{\left(Y_{t+j} - G_{t+j}\right)}{(1+r)^j} + (1+r)B_t$$

$$\lim_{T\to\infty} \frac{B_{t+T+1}}{(1+r)^{T+1}} = 0$$

# Extension to the case with positive growth: when is a country bankrupt?

- The surplus of the trade balance and the current account balance, in period t, respectively are:

$TB_t = Y_t - G_t - C_t$ and $CA_t = rB_t + TB_t = B_{t+1} - B_t$

- Denote foreign assets, the surplus of the current account and the surplus of the trade balance, measured in units of output by: $b_t = \frac{B_t}{Y_t}$, $ca_t = \frac{CA_t}{Y_t}$ and $tb_t = \frac{TB_t}{Y_t}$
- The current account identity becomes (by dividing each side by $Y_t$):

$$ca_t = rb_t + tb_t = (1+g)b_{t+1} - b_t$$

# Extension to the case with positive growth: when is a country bankrupt?

- The IBC and the transversality conditions become

$$0 = \sum_{j=0}^{\infty} \left(\frac{1+g}{1+r}\right)^{j} tb_{t+j} + (1+r)b_t$$

$$\lim_{T\to\infty} \left(\frac{1+g}{1+r}\right)^{T+1} b_{t+T+1} = 0$$

- When observing deficits of the current account both policy makers and participants in international financial markets usually ask the following question: Is the country solvent, i.e. can the country service its foreign debt that has been accumulated while the country ran current deficit?

# Extension to the case with positive growth: when is a country bankrupt?

- Assume that the net foreign assets of the country at the beginning of period $t$ is negative: $B_t,\ b_t < 0$, which means that the foreign debt in units of output is $-b_t$.
- Assume that the country wants to keeps its foreign debt (in units of output) at the same level at the beginning of period $t+1$: $-b_{t+1} = -b_t$. We deduce from the current account identity:

$$ca_t = rb_t + tb_t = gb_t \text{ or}$$
$$tb_t = -(r-g)b_t$$

  - To maintain a constant debt-GDP ratio, the country need pay out only the excess of the interest rate over the growth rate.

# Extension to the case with positive growth: when is a country bankrupt?

- $-(r-g)b_t$ measures the burden a foreign debts imposes on the economy. The higher this burden, the greater the likelihood that the debt is unsustainable, in the sense that the debtor country finds itself unable or unwilling to repay.
- It the country keeps its foreign debt (in units of output) at the same constant level for all future periods: $b_{t+T} = b_t$, for $T \geq 0$.
  - Then its foreign debt: $B_{t+T+1} = b_t Y_{t+T+1} = b_t Y_t (1+g)^T$ increases indefinitely over time.
  - But $\frac{B_{t+T+1}}{(1+r)^{T+1}} = b_t Y_t \left(\frac{1+g}{1+r}\right)^{T+1}$ tends to zero if the growth rate is lower than the interest rate: $g < r$. Then, the transversality condition is satisfied.

# Extension to the case with positive growth: when is a country bankrupt?

- We notice that if the interest rate is lower than the growth rate, a country can keep its debt-GDP ratio constant while running a deficit of its trade balance (finance by new foreign borrowing). Can this favorable situation last forever that is can the interest rate be lower than the growth rate forever?
- We can show that this is impossible in a world where agents live forever, as in this chapter. But it becomes possible with overlapping generations such as those discussed in OR chapter 3.

# Extension to the case with uncertainty

- Remember that consumers make their decisions at the beginning of period *t* for all the following periods. Until now, we have assumed that their future environment, output and government consumption, $Y_{t+j}$ and $G_{t+j}$ $j \geq 0$, and of course the world interest rate, *r*, which is constant are perfectly known to him. Then we have looked at perfect foresight economies.
- Now, we will consider that the past and current values of output and government consumptions are known, but their future values are random variables. The world interest rate is still known and constant that is that there exist a riskless internationally bond, which can be freely traded.

# Extension to the case with uncertainty

The current account identity:

$$(1+r)B_{t+j} = C_{t+j} + G_{t+j} - Y_{t+j} + B_{t+j+1}, j \geq 0$$

and the IBC:

$$\sum_{j=0}^{\infty} \frac{C_{t+j}}{(1+r)^j} = \sum_{j=0}^{\infty} \frac{\left(Y_{t+j} - G_{t+j}\right)}{(1+r)^j} + (1+r)B_t$$

are still valid in this context.

Notice that these two equations are satisfied for each possible value of future output and government consumption.

# Extension to the case with uncertainty

- In this rational expectations setting the consumers utility function has to be substituted by:

$$U_t = E_t\left\{\sum_{j=0}^{\infty}\beta^j u(C_{t+j})\right\}$$

  - Consumers maximize the expected value of lifetime utility, conditional on all information available at the beginning of period $t$, that is the past and current values of output and government consumptions.
  - We notice that $C_{t+j}$ is contingent to the information available at the beginning of period $t+j$. So, it is random if $j>0$. However, $C_t$ is certain.

# Extension to the case with uncertainty

- We substitute in the expression of $U_t$ the expression of $C_{t+j}$, given by the current account identity.

$$U_t = E_t\left\{\sum_{j=0}^{\infty}\beta^j u\left[(1+r)B_{t+j} - B_{t+j+1} + Y_{t+j} - G_{t+j}\right]\right\}$$

The domestic residents maximize this expression with respect to $B_{t+j+1}$

# Extension to the case with uncertainty

- For every period $j \geq 0$, the following foc condition must hold:

$$E_t\left[-u'\left(C_{t+j}\right) + \beta(1+r)u'\left(C_{t+j+1}\right)\right] = 0$$

- $\beta$ , $r$ and $C_t$ are certain. Thus this foc for $j = 0$ becomes:

$$u'(C_t) = \beta(1+r)E_t[u'(C_{t+1})]$$

which is the stochastic version of the Euler equation

# The permanent income model

- We will simplify the analysis by assuming that $\beta(1+r)=1$. Remember that under this assumption, consumption is stationary in a perfect foresight economy: $C_{t+j}=\overline{C}$ for $j \geq 0$.
- We will also assume quadratic utility: $u(C)=C-\frac{a}{2}C^2$, $a>0$. Then, $u'(C)=1-aC$.
- The Euler equation becomes: $1-aC_t=E_t[1-aC_{t+1}]$,

  or: $C_t=E_t(C_{t+1})$
  - Consumption follows a martingale, meaning that the expected value of $C_{t+1}$ conditional on all available information in period $t$ is $C_t$; the best prediction of future consumption is current consumption.

# The permanent income model

- As the IBC is valid for all possible future, its expected value, conditional on the information available in period $t$ is also valid

$$E_t\left[\sum_{j=0}^{\infty}\frac{C_{t+j}}{(1+r)^j}\right]=E_t\left[\sum_{j=0}^{\infty}\frac{\left(Y_{t+j}-G_{t+j}\right)}{(1+r)^j}+(1+r)B_t\right]$$

  - As : $C_t=E_t(C_{t+1})=E_t[E_{t+1}(C_{t+2})]=E_t(C_{t+2})=\ldots=E_t\left(C_{t+j}\right)$ (law of total or iterated conditional expectations), we have

$$\frac{C_t}{1-1/(1+r)}=(1+r)B_t+\sum_{j=0}^{\infty}\frac{E_t\left(Y_{t+j}-G_{t+j}\right)}{(1+r)^j}$$

# The permanent income model

$$C_t = rB_t + \frac{r}{1+r}\sum_{j=0}^{\infty}\frac{E_t\left(Y_{t+j} - G_{t+j}\right)}{(1+r)^j}$$

- With quadratic utility, consumption is determined according to average certainty equivalence principle. People make decisions under uncertainty by acting as if future stochastic variables were sure to turn out equal to their conditional means.
- This equation captures the spirit of the Friedman's permanent income model: consumption is equal to the expected average future income flow.

# The permanent income model

- Even if the decisions in period $t$ are independent of the uncertainty of future output, the consumer intertemporal utility at the beginning of period $t$ , $U_t$, is decreased by this uncertainty. The expected value of future consumption does not depends on uncertainty, but its variability does. As consumers are risk averse (meaning that $u''(C) < 0$ ) their utility decreases with this uncertainty.
- Thus, an insurance or contingent market system, which can reduce this uncertainty, improves the welfare of the domestic residents.

# The permanent income model

- We continue under the simplifying assumption of no government consumption: $G_{t+j} = 0$, for $j \geq 0$.
- We assume that output follows an AR1:

$$Y_{t+j+1} - \overline{Y} = \rho\left(Y_{t+j} - \overline{Y}\right) + \varepsilon_{t+j+1}, \text{ with } \quad 0 \leq \rho \leq 1$$

$\varepsilon_{t+j}$ serially uncorrelated and $E_{t+j}\left(\varepsilon_{t+j+1}\right) = 0$

  - As $E_t\left(\varepsilon_{t+j+1}\right) = 0$ (law of iterated conditional expectations), we have:

$$E_t\left(Y_{t+j+1} - \overline{Y}\right) = \rho E_t\left(Y_{t+j} - \overline{Y}\right) = \rho^{j+1}(Y_t - \overline{Y})$$

$$C_t = rB_t + \frac{r}{1+r}\left[\sum_{j=0}^{\infty} \frac{\overline{Y}}{(1+r)^j} + (Y_t - \overline{Y}) \sum_{j=0}^{\infty} \frac{\rho^j}{(1+r)^j}\right]$$

# The permanent income model

- Finally:

$$C_t = rB_t + \overline{Y} + \frac{r}{1+r-\rho}(Y_t - \overline{Y})$$

  - This equation looks like a Keynesian consumption function: higher current output $Y_t$ raises consumption less than dollar for dollar (if $\rho < 1$).

- We also have

$$Y_{t+j+1} - \overline{Y} = \rho\left(Y_{t+j} - \overline{Y}\right) + \varepsilon_{t+j+1}$$
$$= \rho^{j+2}(Y_{t-1} - \overline{Y}) + \rho^{j+1}\varepsilon_t + \rho^j\varepsilon_{t+1} + \ldots + \varepsilon_{t+j+1}$$

and $Y_t - \overline{Y} = \rho(Y_{t-1} - \overline{Y}) + \varepsilon_t$

# The permanent income model

- Output in period $t$, $Y_t$, is the sum of a part, which was predictable in period $t-1$, $\bar{Y} + \rho(Y_{t-1} - \bar{Y})$ and of an unforeseeable surprise or shock $\varepsilon_t$.
  - If $\rho < 1$, this surprise has less and less effect on future output: in period $t+j+1$ is equal to the fraction $\rho^{j+1}$ if its effect on the output of period $t$. Shocks are transitory.
  - If $\rho = 1$, this surprise has the same effect on all future outputs Shocks are permanent.
- Remember that the current account surplus in period $t$ is

$$CA_t = rB_t + Y_t - C_t = \frac{1-\rho}{1+r-\rho}(Y_t - \bar{Y})$$

# The permanent income model

- The current account surplus can be rewritten:

$$CA_t = \frac{1-\rho}{1+r-\rho}\rho(Y_{t-1} - \overline{Y}) + \frac{1-\rho}{1+r-\rho}\varepsilon_t$$

  - An unexpected positive shock to output ($\varepsilon_t > 0$) causes an unexpected rise in the current account surplus when the shock is temporary ($\rho < 1$), because people smooth expected consumption intertemporally through foreign asset accumulation.
  - A permanent shock ($\rho = 1$), has no current account effect because consumption remains level (in expectation) if people simply adjust consumption by the full innovation to output.

# The permanent income model

- The last equation suggests a positive correlation between the surplus of the current account, which is the same as national saving here, and output.
- Vegh (2010) gives a table with the correlation between the cyclical components of national saving (as a proportion of GDP) and of GDP. The correlation is positive for most countries, but not so high.
- The following example will extend our model and give a possible explanation (among others) for the low (and sometimes negative) correlation observed in the table.

# The permanent income model

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**Table 1. Correlation between GDP and saving/GDP**

| Industrial | | Latin America | | Other developing | |
|---|---|---|---|---|---|
| Australia | 0.31 | Argentina | -0.17 | Algeria | 0.13 |
| Austria | 0.21 | Bolivia | 0.32 | Gambia | 0.00 |
| Belgium | 0.25 | Brazil | 0.20 | Hong Kong | 0.19 |
| Canada | 0.51 | Chile | 0.02 | Hungary | 0.45 |
| Denmark | 0.22 | Colombia | 0.31 | Iceland | -0.05 |
| Finland | 0.58 | Costa Rica | 0.14 | India | 0.28 |
| France | 0.28 | Dominican Republic | -0.02 | Indonesia | 0.10 |
| Germany | 0.24 | Ecuador | 0.19 | Iran | 0.44 |
| Greece | -0.19 | El Salvador | 0.37 | Israel | 0.11 |
| Ireland | 0.05 | Guatemala | 0.16 | Kenya | -0.05 |
| Italy | 0.11 | Guyana | 0.16 | Malaysia | 0.03 |
| Japan | 0.28 | Honduras | 0.25 | Pakistan | 0.00 |
| Netherlands | 0.09 | Mexico | 0.03 | Saudi Arabia | 0.43 |
| New Zealand | 0.46 | Nicaragua | 0.42 | Singapore | 0.23 |
| Norway | 0.18 | Trinidad and Tobago | -0.10 | South Africa | 0.11 |
| Portugal | 0.23 | Paraguay | -0.05 | Syria | 0.03 |
| Sweden | 0.55 | Peru | 0.36 | Thailand | 0.16 |
| Switzerland | 0.55 | Uruguay | -0.16 | Tunisia | -0.25 |
| United States | 0.20 | Venezuela | 0.01 | Turkey | 0.10 |
| Average | 0.27 | Average | 0.13 | Average | 0.13 |

Annual data from the World Bank. World Development Indicators (2010)
Sample period: 1970-2007

# News shock and the current account: Evidence from giant oil discoveries?

- There is a delay between a giant oil discovery by a country, and the start of production, of, on average, between 4-6 years.
- We will present a test of the idea that, when production has begun, the country will accumulate foreign assets and run a balance of payments surplus for the times when oil reserves will be exhausted.
- But before production, the country will anticipate its new wealth by consuming more, borrowing from the international market and running a current account deficit.

# News shock and the current account: Evidence from giant oil discoveries?

- One historical example of the "anticipated effect" of giant oil discoveries on the current account is Norway in the 1970s when its current deteriorated significantly. The country borrowed extensively to build up its North Sea oil production following the first discoveries in the late 1960s and early 1970s, and its saving rate also declined due to expectation of higher future output. The current account started to improve as the saving began to rise and the investment demand declined as the oil production started in the late 1970s

# News shock and the current account: Evidence from giant oil discoveries?

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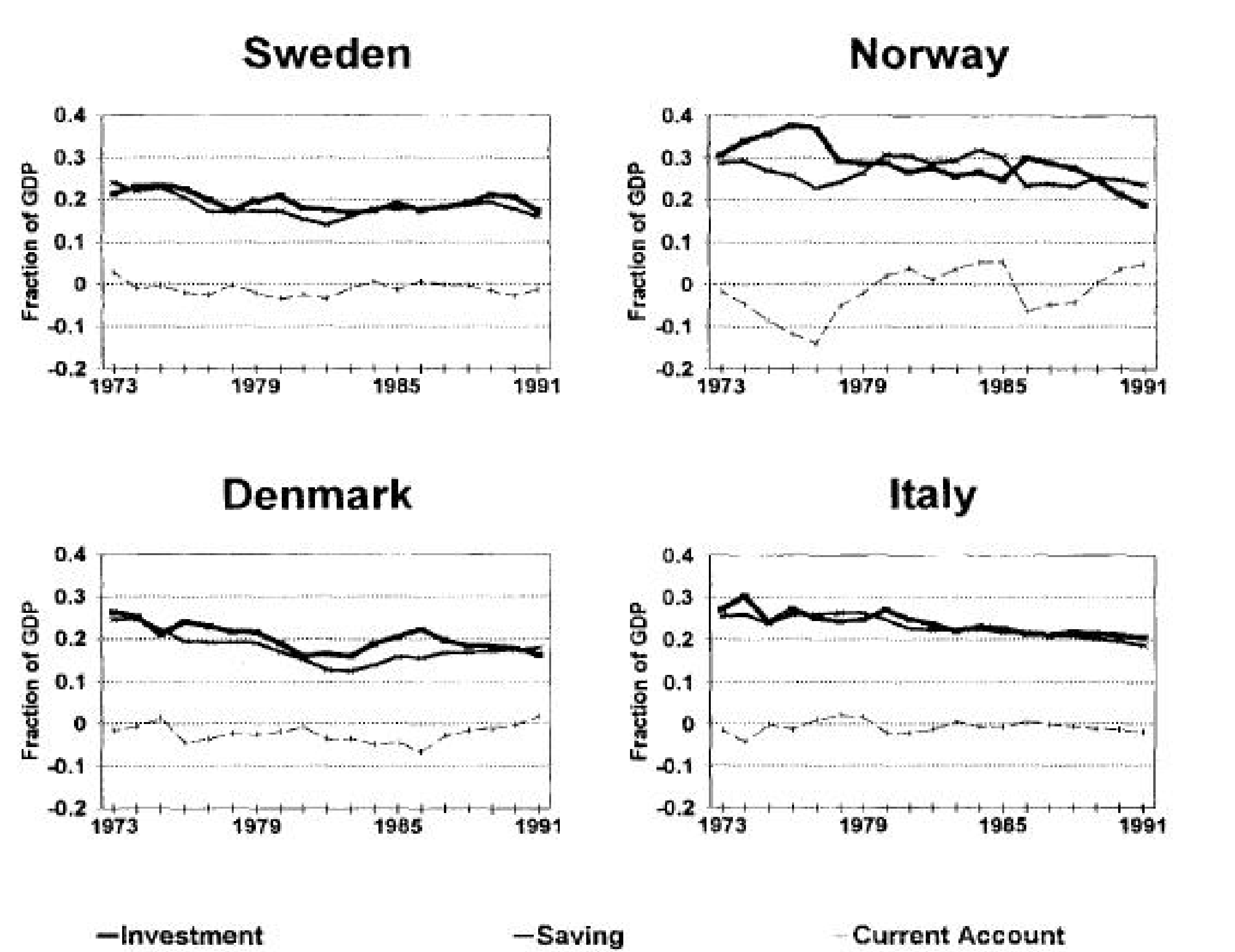



Figure 2.3. Saving, investment, and the current account: Post-Bretton Woods era, 1973–1991.

# News shock and the current account: Evidence from giant oil discoveries?

- Arezki and Sheng (2013) start from the same consumption equation as us

$$C_t = rB_t + \overline{Y} + \frac{r}{1+r}\sum_{j=0}^{\infty}\frac{E_t\left(Y_{t+j}-\overline{Y}\right)}{(1+r)^j}$$

and the same stochastic process for output

$Y_{t+j+1} - \overline{Y} = \rho\left(Y_{t+j} - \overline{Y}\right) + \varepsilon_{t+j+1}$, with $0 \leq \rho < 1$

# News shock and the current account: Evidence from giant oil discoveries?

- However, they assume

$$\varepsilon_{t+j+1} = \eta_{0,t+j+1} + \eta_{1,t+j}$$

where is $\eta_{0,t+j+1}$ is a shock unanticipated in period $t + j$ and $\eta_{1,t+j}$ is a one-period ahead news shock, which materializes in period $t+j+1$, but that the agents learn in period $t+j$:

$E_{t+j}(\eta_{0,t+j+1}) = 0$, $E_{t+j}(\eta_{1,t+j}) = \eta_{1,t+j}$,

$E_{t+k}(\eta_{1,t+j}) = 0$, for $k<j$

- In period $t + j$ the domestic residents are told of a giant oil discovery, but production will start, and its precise value will be known, in period $t+j+1$.

# News shock and the current account: Evidence from giant oil discoveries?

- Then $E_t\left(Y_{t+j+1}-\overline{Y}\right)=\rho^{j+1}\left(Y_t-\overline{Y}+\eta_{1,t}\right)$
- Finally

$$C_t = rB_t + \overline{Y} + \frac{r}{1+r-\rho}\left(Y_t-\overline{Y}+\eta_{1,t}\right)$$

$$CA_t = \frac{1-\rho}{1+r-\rho}\rho(Y_{t-1}-\overline{Y}) + \frac{1-\rho}{1+r-\rho}\left(\eta_{0,t}+\eta_{1,t-1}\right) - \frac{r}{1+r-\rho}\eta_{1,t}$$

# News shock and the current account: Evidence from giant oil discoveries?

- *First interpretation*. In period $t$ the country does not produce oil yet: $\varepsilon_t = \eta_{0,t} + \eta_{1,t-1} = 0$. But its domestic residents know that it will produce oil in the next period: $\eta_{1,t} > 0$. They anticipate this bonanza by immediately increasing their consumption and financing its cost by borrowing from abroad. The current account deteriorates.

# News shock and the current account: Evidence from giant oil discoveries?

- *Second interpretation*. In period $t$ the country produce oil: $\varepsilon_t = \eta_{0,t} + \eta_{1,t-1} > 0$. As this bonanza will be transitory, the domestic residents smooth their consumption by accumulating foreign assets, which they will use after the end of their oil rent. So, the current account improves. However, as they have anticipated their good fortune by increasing their consumption in the previous period, and borrowing from the international market, they also have to pay this borrowing back. This lowers the improvement in the current account.

# News shock and the current account: Evidence from giant oil discoveries?

- To test the theoretical prediction of our model, the authors estimate a dynamic panel distributed lag model over a sample covering the period 1970-2012 for up to 170 countries. In total, 72 countries have had at least one giant oil discovery during the sample period.
- They find evidence for a statistically and economically significant anticipation effect on the current account and saving following the announcement of a giant oil discovery.

# News shock and the current account: Evidence from giant oil discoveries?

- In the years immediately following the discoveries, the current account decreases significantly as investment rises and saving declines. Five years after the discovery, the average effect of giant oil discoveries on the current account turns out to be positive and significant, as saving raise and investment declines. A peak effect is reached about eight years following the discovery after which the effect of giant oil discoveries starts bottoming off.
- The announcement of a giant oil discovery of average size that is of a net present value of about 20 percent of GDP would lead to an anticipated effect in the form of a decrease in the current account by about 1 percent of GDP at its peak, 2 years after the discovery.

# News shock and the current account: Evidence from giant oil discoveries?

- 8 years after the discovery the increase in the current account will reach a peak of a little more than 1 percent of GDP.

# Precautionary saving

- Under the assumption of quadratic preferences we have been able to obtain a series of simple and important results. However, under these preferences, uncertainty does not matter for consumers' decisions, which are only guided by the expected value of future income.
- If $\rho < 1$, output fluctuates around the constant value $\overline{Y}$ and the current account surplus, which is equal to national savings, $CA_t = \frac{1-\rho}{1+r-\rho}(Y_t - \overline{Y})$, fluctuates around zero (the unconditional expected value of $CA_t$ is zero).

# Precautionary saving

- However, it is likely that under this circumstance, people would accumulate precautionary savings that is that national savings and the surplus of the current account should fluctuate around a positive value. This value should increase with the level of uncertainty of future income (or more generally of the future environments of the domestic residents).
- If we use a utility function $u(.)$, with a positive third derivative, $u'''(C) > 0$ (then consumers are called prudent), instead of being quadratic, savings and the surplus of the current account balance fluctuate around such a positive value, which is the consumers precautionary savings.

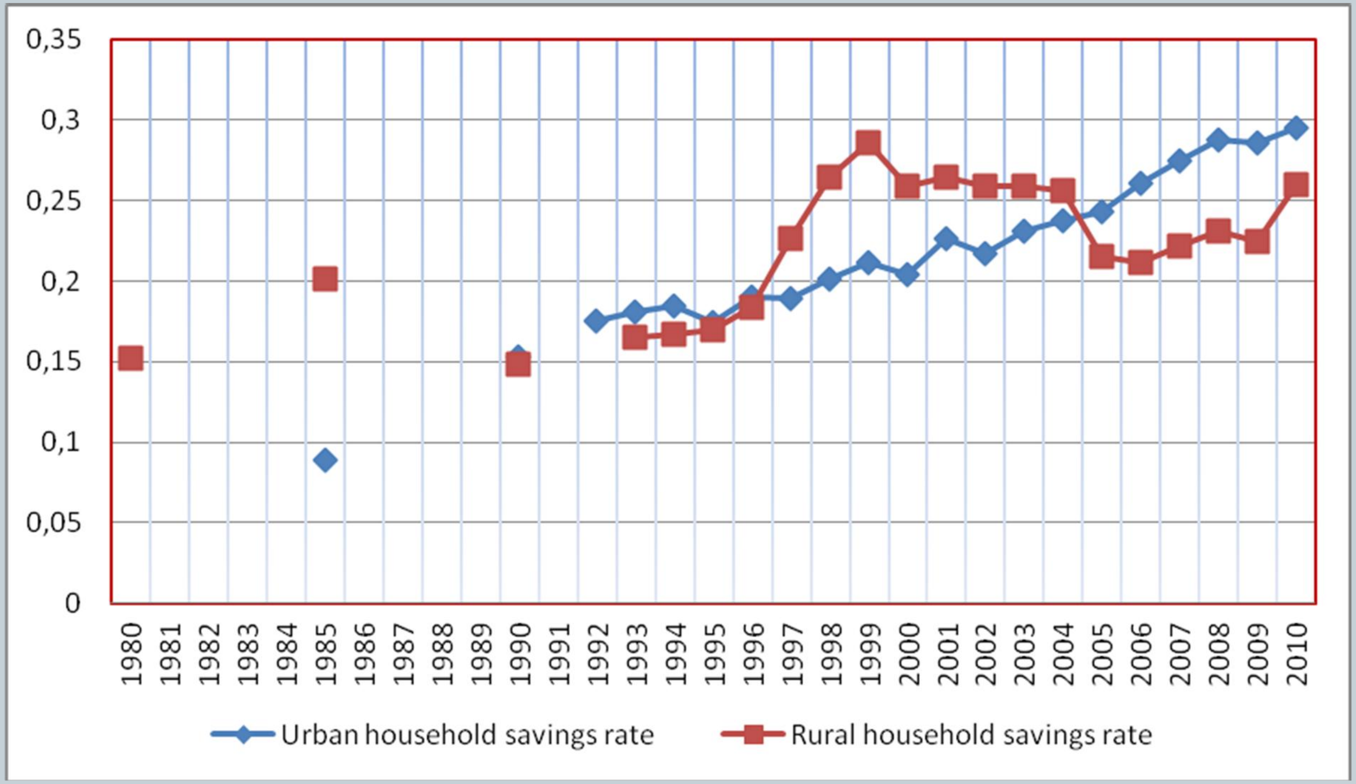
# Precautionary saving

- There is a series of empirical studies, which show that precautionary household savings, and total household savings, was very high in Taiwan, Japan and Korea, and then started to decrease when these countries introduced health insurance systems, unemployment benefits, etc. which decreased the risk faced by households.

# Precautionary saving

- The following graph represent household savings in China.
- The Chinese urban household savings rate steadily increased from 8.9% in 1985 to 29.5% in 2010; the rural household savings rate fluctuated much, but along an upward trend.
- This high household savings is one of the explanations of the high surplus of the current account, in China,
- An explanation of part of the high household savings rate in China, rests on the effects of the increase in uncertainty, which has characterized all the economies in transition, but especially China, and which has induced households to build high precautionary savings (Blanchard and Giavazzi, 2006).

# Precautionary saving




**Graph 10: Household savings rate** (Household surveys data)

# Precautionary saving

- To test the validity of this explanation, economists have to find good indicators of risk. For instance, Wei and Zhang (2011) perform a panel regression on thirty-one provinces from 1980 to 2007, to analyze their household savings rate. They use the proportion of the local labor force that works for state-owned firms or government agencies as a proxy for the degree of job security. They also include the share of local labor force enrolled in social security as a proxy for the extent of the local social safety net. Both coefficients are negative and statistically significant, which supports the precautionary savings motive.

# Precautionary saving

- The country's household registration system, or *hukou*, limits the access of rural migrants to public services in the cities where they work and live. Moreover, migrants are discriminated against within the labor market and have a higher level of mobility. Chen, Lu and Zhong (2012) run a series of regressions on a sample of urban and migrant households and conclude that migrants without an urban *hukou* spend thirty-one per cent less than otherwise similar urban residents. These results suggest that migrants save more for precautionary purpose due to higher income risks and the lack of social security coverage.

# Precautionary saving

- Finally, the authors compute that the removal of the *hukou* system would lead to a rise in aggregate consumption by 4.2% of household consumption and 1.8% of GDP.
- Other empirical analysis conclude to strong precautionary savings of Chinese households (Chamon and Prasad, 2010, against health risk; Meng, 2003, against unemployment risk; Chamon, Liu and Prasad, 2010, against income risk; Giles and Yoo, 2007, against agricultural activities risk measured by rainfall variability - see also Julan and Ravaillon, 2001).