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# FINANCIAL INTEGRATION AND CRISES 2021

## Lecture 4

# Lecture 4 - Introduction



## The Intertemporal Approach to the Current Account

- The dynamics of the CA as determined by 'Consumption smoothing' against output and investment fluctuations
  - Shocks: Temporary vs. Permanent – Anticipated vs. Unanticipated

It shows the role of financial integration for

- Absorption of domestic shocks and consumption smoothing
- Investment financing without decreasing consumption

A benchmark to evaluate global imbalances

**References:**

Obstfeld, M. and K. Rogoff (1996) *Foundations of International Macroeconomics*, Chap. 2

SUW (2021) Chap. 3, 4, 5

# Model assumptions



Consumption and investment are chosen by agents/countries who **behave optimally given their objectives and constraints.**

- Small open economy; world prices and interest rates are 'exogenous'
- Prices are fully flexible - Output is supply determined
- The nominal exchange rate does not matter
- No valuation effects: $B_t - B_{t-1} = CA_t = rB_{t-1} + TB_t$
- **One type of real bond** internationally traded
- Bonds are freely traded while $K$ is held within the country
- Infinite horizon, i.e. parents care about their children:

- $U_t = u\left(C_t^y; C_{t+1}^o\right) + \beta E_t U_{t+1}$
- $U_t = u\left(C_t^y; C_{t+1}^o\right) + \beta E_t u\left(C_{t+1}^y; C_{t+2}^o\right) + \beta^2 E_t U_{t+2}$

# Household's maximization problem



The representative dynasty **maximizes the Utility**

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

subject to the **flow resource constraints** (and the No-Ponzi game conditions)

- $B_{t+i} + C_{t+i} = (1 + r_t)B_{t-1+i} + Y_{t+i} - G_{t+i} - I_{t+i}$ $\quad i = 1, 2, 3, ..$

Set the Lagrangian

- Max $E_t \sum_{i=0}^{\infty} \beta^i u(C_{t+i}) - \lambda_t[B_t + C_t - (1 + r_t)B_{t-1} - Y_t + G_t + I_t] +$

$-E_t \beta \lambda_{t+1}[B_{t+1} + C_{t+1} - (1 + r_{t+1})B_t - Y_{t+1} + G_{t+1} + I_{t+1}] - E_t \beta^2 \lambda_{t+2}[.]$

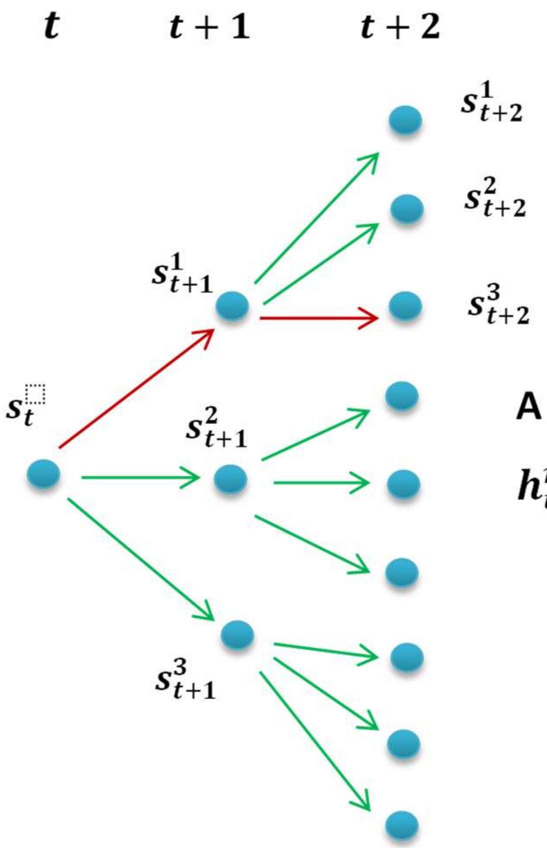
- Note that expectations are taken over all possible future realizations of our variables, that is, $E_t X_{t+N} = \sum_{h_N=1}^{H} \pi_t^{h_N} X_{t+N}^{h_N}$ (for discrete distributions)
- These realizations depend on sequences of events, more precisely, on histories of states of nature up to time $t$+N, here denoted by $h_N$.

# Histories of states of nature



At $t$+1 there are 3 states/histories: 3 consumption goods and 3 constraints

At $t$+2 there are 9 histories and thus 9 consumption goods; 9 constraints




**A possible (red) history**

$$h_{t+2}^{r} = [S_{t+2}^{3}\,, S_{t+1}^{1}, S_t]$$

# A more careful maximization problem



Consider the **Utility Function** that is maximized:

- $U_t = E_t \sum_{i=0}^{\infty} \beta^i \, u(C_{t+i})$ Note that it can be written as
- $U_t = u(C_t) + \sum_{h_1=1}^{\mathrm{H}_1} \pi_t^{h_1} \, \beta u\left(C_{t+1}^{h_1}\right) + \sum_{h_2=1}^{\mathrm{H}_2} \pi_t^{h_2} \, \beta^2 u\left(C_{t+2}^{h_2}\right) + \cdots$

where $h_j$=1, 2, …$\mathrm{H}_j$ denote the $\mathrm{H}_j$ possible histories at time $t$+$j$, so that at $t$+*1* there are $\mathrm{H}_1$ different possible consumptions : $C_{t+1}^1$, $C_{t+1}^2$… depending on the realization of the state of nature; $\mathrm{H}_2$ at $t$+2, etc.

- In maximizing the utility function we must thus consider each $C_{t+1}^{h_1}$ as a different good $C_{t+1}^1 \neq C_{t+1}^2 \neq \cdots \neq C_{t+1}^{H_1}$
- The resource constraint would also differ depending on the history:

While there is just one constraint at time $t$, instead **at $t$+1 there are $H_1$ different budget constraints, and at $t$+2 there are $H_2$ different budget constraints, one for each history of states of nature.**

# Utility maximization



**Lagrangian**

- $Max \quad u(C_t) + \sum_{h_1=1}^{H_1} \pi_t^{h_1} \beta u\left(C_{t+1}^{h_1}\right) + \sum_{h_2=1}^{H_2} \pi_t^{h_2} \beta^2 u\left(C_{t+2}^{h_2}\right) + \cdots$

  $-\lambda_t[B_t + C_t - (1+r_t)B_{t-1} - Y_t + G_t + I_t] +$

  $-\beta \sum_{h_1=1}^{H_1} \pi_t^{h_1} \lambda_{t+1}^{h_1}\left[B_{t+1}^{h_1} + C_{t+1}^{h_1} - (1+r_{t+1})B_t - Y_{t+1}^{h_1} + G_{t+1}^{h_1} + I_{t+1}^{h_1}\right] + ..$

**In extensive notation is**

- $Max \quad u(C_t) + \pi_t^1 \beta u(C_{t+1}^1) + \pi_t^2 \beta u(C_{t+1}^2) + \pi_t^3 \beta u(C_{t+1}^3) \ldots$

  $-\lambda_t[B_t + C_t - (1+r_t)B_{t-1} - Y_t + G_t + I_t] +$

  $-\beta \pi_t^1 \lambda_{t+1}^1 [B_{t+1}^1 + C_{t+1}^1 - (1+r_{t+1})B_t - Y_{t+1}^1 + G_{t+1}^1 + I_{t+1}^1] +$

  $-\beta \pi_t^2 \lambda_{t+1}^2 [B_{t+1}^2 + C_{t+1}^2 - (1+r_{t+1})B_t - Y_{t+1}^2 + G_{t+1}^2 + I_{t+1}^2] +$

  $-\beta \pi_t^3 \lambda_{t+1}^3 [B_{t+1}^3 + C_{t+1}^3 - (1+r_{t+1})B_t - Y_{t+1}^3 + G_{t+1}^3 + I_{t+1}^3] +$

  $+ \cdots +$

**Note: $B_t$ is known and enters all constraints of time t+1 (with the same return)**

# First order conditions



Assume for the moment that $Y_t$ and $I_t$ are given.

**Take the derivative with respect to $C_t$ and each $C_{t+i}^{h_i}$**

- $u'(C_t) = \lambda_t$ (0)
- $\cancel{\beta\pi_t^{h_i}}u'\left(C_{t+i}^{h_i}\right) = \cancel{\beta\pi_t^{h_i}}\lambda_{t+i}^{h_i} \rightarrow u'\left(C_{t+i}^{h_i}\right) = \lambda_{t+i}^{h_i}$
- $u'\left(C_{t+1}^{h_1}\right) = \lambda_{t+1}^{h_1}$ (1) one FOC for each history $h_1$ of states of nature

**Take the derivative with respect to $B_t$**

$$-\lambda_t + \beta\pi_t^1\lambda_{t+1}^1(1 + r_{t+1}) + \beta\pi_t^2\lambda_{t+1}^2(1 + r_{t+1}) + \beta\pi_t^3\lambda_{t+1}^3(1 + r_{t+1}) + .. = 0$$

- $-\lambda_t + \beta E_t\lambda_{t+1}(1 + r_{t+1}) = 0$ (2)

**Combine equations (0), (1) and (2)**

- $u'(C_t) = \beta E_t u'(C_{t+1})(1 + r_{t+1})$ **Euler Equation**
- $\lim_{T\to\infty} \pi_t^J \beta^T \lambda_{t+T}^J B_{t+T}^J = 0$ **Transversality Conditions -** one for each history $J$

# Equilibrium conditions



- Along the optimal path we have the

**Euler Equation(s)**

- $u'(C_t) = \beta E_t u'(C_{t+1})(1 + r_{t+1})$ (3)

**Transversality Conditions**

- $\lim_{T \to \infty} \pi_t^J \beta^T u'\left(C_{t+T}^J\right) B_{t+T}^J = 0$ (4)

- Although No-Ponzi game conditions are usually assumed, note that the No-Ponzi game conditions are implied by the Tranversality conditions of foreign consumers that bind our debt growth.
- This provides a model-based justification of No-Ponzi game conditions.
- Note that the correct discount factors to be used are marginal rates of substitution between current and future history-contingent consumption.

# Intertemporal Budget Constraint



- Assume a constant $r_t = r$ and note that the constraint
- $B_t + C_t = (1+r)B_{t-1} + Y_t - G_t - I_t$ is equal to
- $B_t = (1+r)B_{t-1} + TB_t$. Then, we have the
- **Intertemporal Budget Constraint**

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

or

- $\sum_{i=0}^{\infty} \frac{1}{(1+r)^i} E_t C_{t+i} = (1+r)\, B_{t-1} + \sum_{i=0}^{\infty} \frac{1}{(1+r)^i} E_t[Y_{t+i} - G_{t+i} - I_{t+i}]$ (5)

# Consumption Smoothing



- Assume $\beta(1+r)=1$ and a quadratic utility:
- $u(C_t) = C_t - \frac{b}{2}C_t^2$ so that $u'(C_t) = 1 - bC_t$

  and the Euler Equations (3) imply that
- $E_t C_{t+1} = C_t$ consumption is a random walk (6)
- $E_t C_{t+i} = C_t$ for any $i \geq 1$ (7)
- Substituting $C_t$ for $E_t C_{t+i}$ in the IBC yields
- $C_t \sum_{i=0}^{\infty} \frac{1}{(1+r)^i} = (1+r)\, B_{t-1} + \sum_{i=0}^{\infty} \frac{1}{(1+r)^i} E_t[Y_{t+i} - G_{t+i} - I_{t+i}]$ (8)

**Permanent Income Consumption**

- $C_t = r\, B_{t-1} + \frac{r}{1+r} \sum_{i=0}^{\infty} \frac{1}{(1+r)^i} E_t[Y_{t+i} - G_{t+i} - I_{t+i}]$ (9)

Consumption is determined according to the certainty equivalence principle: consumer behaves as if future stochastic variables turned out to be equal to expected values.

# Dynamics of the Current Account



- Define the permanent level of a variable $X_t$ as the constant value $\bar{X}_t$ that yields the same present value of $X_t$
  - $\sum_{i=0}^{\infty} \frac{1}{(1+r)^i} \bar{X}_t = \sum_{i=0}^{\infty} \frac{1}{(1+r)^i} E_t X_{t+i}$ (10)
  - $\bar{X}_t = \frac{r}{1+r} \sum_{i=0}^{\infty} \frac{1}{(1+r)^i} E_t X_{t+i}$ (11)
- This allows us to write **permanent-income consumption** (9) as
  - $C_t = r\, B_{t-1} + \bar{Y}_t - \bar{G}_t - \bar{I}_t$ (12)
  - Recalling the $CA_t = rB_{t-1} + Y_t - C_t - G_t - I_t$ we have

**Current Account Dynamics**

- $CA_t = (Y_t - \bar{Y}_t) - (G_t - \bar{G}_t) - (I_t - \bar{I}_t)$ (13)

# Current Account determination with consumption smoothing



Fin. Int. allows to absorb domestic specific shocks and to smooth consumption

- $CA_t = B_t - B_{t-1} = (Y_t - \bar{Y}_t) - (G_t - \bar{G}_t) - (I_t - \bar{I}_t)$
  - In good times when $Y_t$ is above its permanent level $CA_t > 0$, people save and accumulate foreign assets (if $I_t \approx \bar{I}_t$ )
  - In bad times people sell foreign assets or borrow internationally to maintain $C_t$
  - When investment needs, $I_t$ , are high, then $CA_t < 0$: people finance $I_t$ on world capital markets
  - When $G_t$ is high (i.e. wars) it is financed with foreign capital

- Note that, as consumption is at its permanent level, $C_t = \bar{C}_t$ :

- $CA_t = (Y_t - \bar{Y}_t) - (G_t - \bar{G}_t) - (I_t - \bar{I}_t) - (C_t - \bar{C}_t) =$
- $CA_t \equiv rB_{t-1} + TB_t = TB_t - \overline{TB}_t \quad \rightarrow \quad rB_{t-1} = -\overline{TB}_t$

- Net investment income finances a permanent trade deficit (or a permanent surplus finances payments on foreign liabilities).

# Output Shocks and the Current Account



- For simplicity, set $I_t = 0$ and $G_t = 0$. Then

**Permanent Income Consumption** (here $\bar{Y}$ is not permanent income)

- $C_t = r\, B_{t-1} + \bar{Y} + \frac{r}{1+r} \sum_{i=0}^{\infty} \frac{1}{(1+r)^i} E_t[Y_{t+i} - \bar{Y}]$ (1)

- Consider an autoregressive stochastic process for $Y_t$ :

- $Y_{t+1} - \bar{Y} = \rho(Y_t - \bar{Y}) + \varepsilon_{t+1}$ with $0 \leq \rho \leq 1$; $E_t \varepsilon_{t+1} = 0$

- Then, $E_t[Y_{t+i} - \bar{Y}] = \rho^i [Y_t - \bar{Y}]$ (2)

- and substituting it in the consumption function above

- $C_t = r\, B_{t-1} + \bar{Y} + \frac{r}{1+r-\rho} [Y_t - \bar{Y}]$ (3)

- $C_t = r\, B_{t-1} + \bar{Y} + \frac{r\,\rho}{1+r-\rho} [Y_{t-1} - \bar{Y}] + \frac{r}{1+r-\rho} \varepsilon_t$ (4)

- and substituting this equation for $C_t$ in $CA_t = r\, B_{t-1} + Y_t - C_t$

# Current Account determination



In an economy **without capital** where $I_t = 0$ and with $G_t = 0$

- $CA_t = \frac{(1-\rho)}{1+r-\rho}\rho[Y_{t-1} - \bar{Y}] + \frac{1-\rho}{1+r-\rho}\varepsilon_t$ (5)
  - Temporary output shocks, $\rho < 1$, improve the $CA_t$
  - The change in $CA_t$ decreases with the persistence, $\rho$, of the shock; the more persistent is the shock the greater is the change in $C_t$
  - Permanent shocks, $\rho = 1$, do not affect the $CA_t$

If future output increases more than current output as in the case:

- $Y_{t+1} - Y_t = \rho(Y_t - Y_{t-1}) + \varepsilon_{t+1}$ (6)

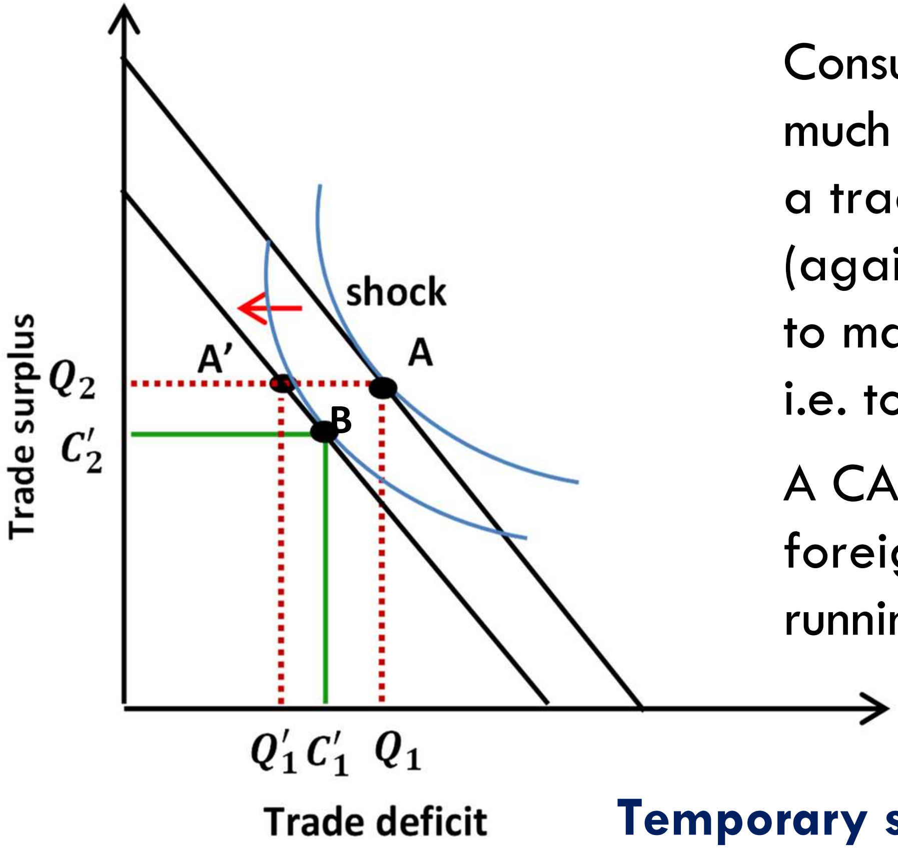
- $C_t$ would rise more than $Y_t$ and $CA_t$ would worsen.

**The introduction of capital may change the first prediction.**

# Example: Temporary bad output shock



Consider a temporary bad output shock that reduces output only in period 1, eg because of bad weather conditions (a drought reduces coffee crops in Ethiopia).




Consumption in period 1 is not reduced as much as output (AB vs AA'); the country runs a trade deficit and borrows internationally (against its future unchanged output) to maintain a stable consumption path, i.e. to smooth consumption.

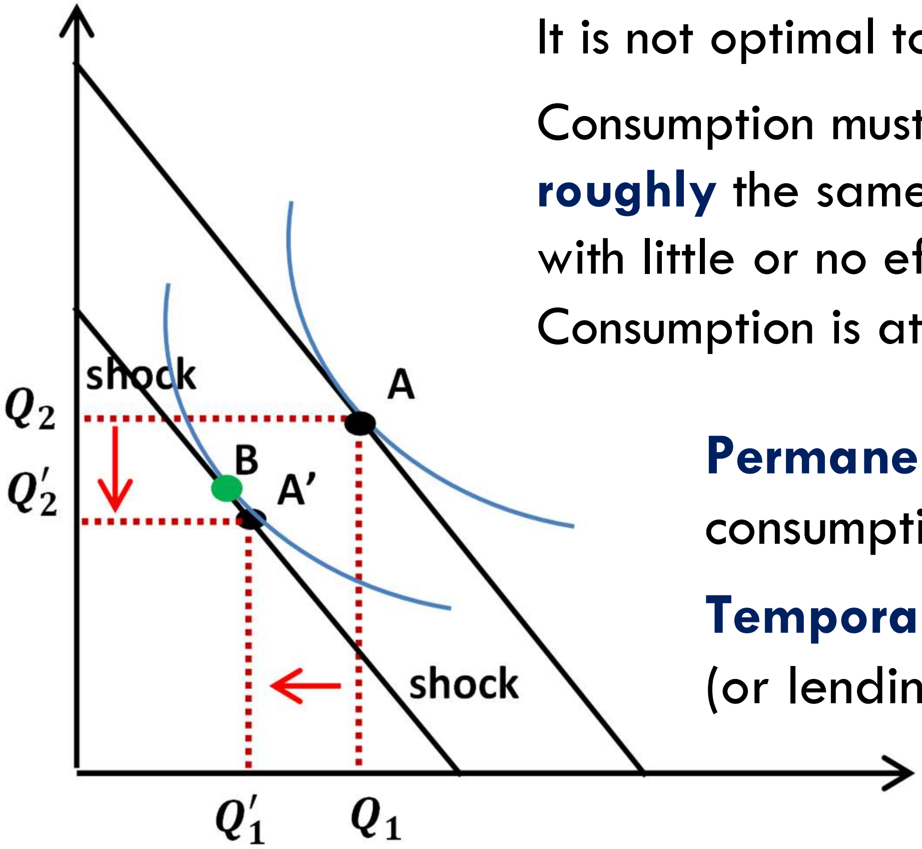
A CA deficit emerges in period 1, and foreign debt is repaid in period 2 by running a CA surplus.

**Temporary shocks are smoothed out by borrowing; a benefit of financial integration.**

# Example: Permanent bad output shock



**The bad shock is permanent: $Q_2$ falls as much as $Q_1$**




It is not optimal to borrow;

Consumption must be cut in both periods by **roughly** the same size of the decline in output with little or no effect on TB or CA.

Consumption is at point B while output at point A'

**Permanent shocks** lead to large changes in consumption leaving CA almost unaffected.

**Temporary shocks** are offset by borrowing (or lending) with large movements in CA.

# Output shocks – Role of Expectations



- The effects of output shocks on consumption and the CA depend on whether shocks are:
  - Temporary or Permanent

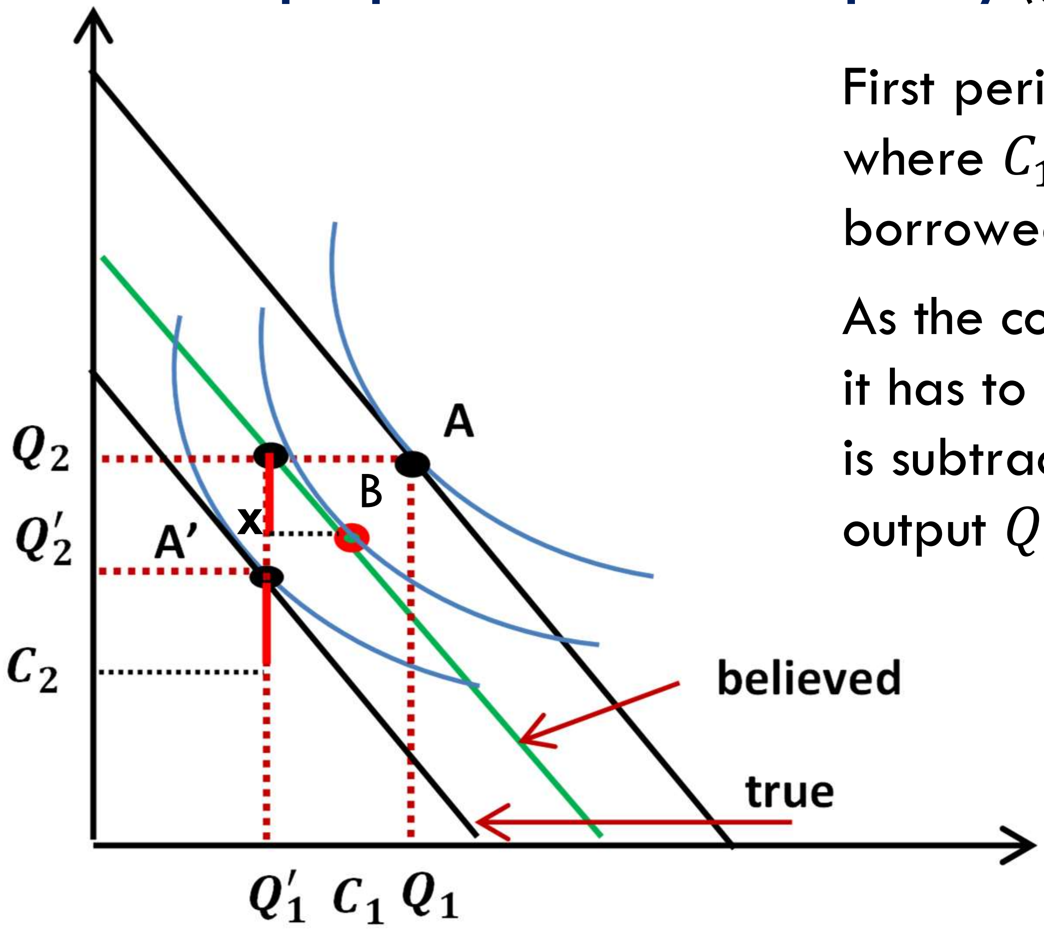
Temporary output shocks should not much affect consumption (they affect saving) and thus lead to greater changes in the CA balance.

- Importantly, to the extent that **the duration of shocks is uncertain**, their effects on consumption and the CA depend on whether shocks are:
  - Expected to be Temporary
  - Expected to be Permanent
- Positive output shocks that are **erroneously expected to be permanent** may lead to large increase in consumption and CA deficits that are not sustainable in the long run when shocks reveal to be temporary.

# Wrong expectations about shock duration



Suppose the (bad) output shock is permanent leading to point A' but **people believe it is temporary** (green resource constraint).




First period Consumption is at point B where $C_1 > Q_1'$ so that $C_1 - Q_1'$ is borrowed internationally.

As the country enters period 2 with debt, it has to repay the red segment $x\ Q_2$ that is subtracted from unexpectedly low output $Q_2'$ to find consumption $C_2$.

Note that $\boldsymbol{C_2}$ **is much lower than** $\boldsymbol{C_1}$

**A crisis may break up!**

# Investment Decision



- **Introduce capital**
- $Y_t = A_t F(K_{t-1})$ and $I_t = K_t - K_{t-1}$
- The resource constraint becomes
- $B_t + K_t + C_t = (1 + r_t)B_{t-1} + K_{t-1} + A_t F(K_{t-1}) - G_t$
- and the representative dynasty maximizes:

$$E_t \sum_{i=0}^{\infty} \beta^i \, u(C_{t+i}) - E_t \lambda_t [B_t + K_t + C_t - (1 + r_t)B_{t-1} - K_{t-1} - A_t F(K_{t-1}) + G_t] +$$

$$-E_t \beta \lambda_{t+1} [B_{t+1} + K_{t+1} + C_{t+1} - (1 + r_{t+1})B_t - K_t - A_{t+1} F(K_t) + G_{t+1}] - E_t \, \beta^2 \lambda_{t+2} [$$

- **FOCs include additional conditions (5) and (6)**
- $u'(C_t) = \lambda_t \;\; ; \quad u'\left(C_{t+1}^{h_1}\right) = \lambda_{t+1}^{h_1}$ (1) one for each history $h_1$
- $-\lambda_t + E_t \lambda_{t+1}^{h_1} \left(1 + A_{t+1}^{h_1} F'(K_t)\right) = 0$ (5)
- $\lim_{T \to \infty} \pi_t^J \beta^T \lambda_{t+T}^J \, K_{t+T}^J = 0$ (6) Transversality (one for each history $J$)

# The risk premium



- Along the optimal path, from (1) and (5) we have the

**Euler Equation** (we drop the superscripts $h_1$ for ease of notation)

- $u'(C_t) = \beta E_t u'(C_{t+1})(1 + A_{t+1}F'(K_t))$ (7)

- Then, recalling the Euler Equation for $B_t$ with $r_{t+1} = r$

- $u'(C_t) = \beta E_t u'(C_{t+1})(1 + r) = \beta E_t u'(C_{t+1})(1 + A_{t+1}F'(K_t))$ (8)
- $rE_t u'(C_{t+1}) = E_t u'(C_{t+1})E_t A_{t+1}F'(K_t) + \mathrm{Cov}_t(u'(C_{t+1})A_{t+1}F'(K_t))$ (9)
- $E_t A_{t+1}F'(K_t) = r - \dfrac{\mathrm{Cov}_t(u'(C_{t+1})A_{t+1}F'(K_t))}{E_t u'(C_{t+1})}$ (10)

$$r - \frac{\cancel{(1+r)}\beta \mathrm{Cov}_t(u'(C_{t+1})A_{t+1}F'(K_t))}{u'(C_t)} \quad (11)$$

- $E_t A_{t+1}F'(K_t) = r + p_t$ (12) where $p_t > 0$ is **the risk premium**

# Investment function



- Note that capital at the end of period $t$, $K_t$, is in the information set at $t$ since it is determined by investment in period $t$:
  - $E_t A_{t+1} F'(K_t) = F'(K_t) E_t A_{t+1} = r + p_t$ (13)
- Hence, $K_t$ and investment, $I_t = K_t - K_{t-1}$, are functions of $E_t A_{t+1}$
  - $K_t = F'^{-1}\left(\frac{r+p_t}{E_t A_{t+1}}\right)$ (14) with $K_t$ increasing with $E_t A_{t+1}$

  where $F'^{-1}$ is the inverse of $F'$ . Example: $F(K_t) = \frac{1}{\alpha} K_t^{\alpha}$
  - $K_t = \left(\frac{E_t A_{t+1}}{r+p_t}\right)^{\frac{1}{1-\alpha}}$
- Now, assume that $p_t > 0$ is constant or negligible and
  - $A_{t+1} - \bar{A} = \rho[A_t - \bar{A}] + \varepsilon_{t+1}$ with $E_t \varepsilon_{t+1} = 0$ and $0 \leq \rho \leq 1$

# Productivity Shocks and the Current Account



Note that a shock $\varepsilon_t$ at $t$ implies $E_t A_{t+1} = \bar{A} + \rho\varepsilon_t$, $E_t A_{t+2} = \bar{A} + \rho^2\varepsilon_t$ etc.

- Hence persistent ($\rho$>0) productivity shocks not only increase current output $A_t F(K_{t-1})$ but also future productivity and thus investment and future output.
- In fact, to the extent that $\rho > 0$ a shock $\varepsilon_t \uparrow \rightarrow K_t \uparrow \rightarrow A_{t+1}F(K_t) \uparrow\uparrow$

Recall: $C_t = rB_{t-1} + \frac{r}{1+r}\sum_{i=0}^{\infty}\frac{1}{(1+r)^i}E_t[Y_{t+i} - G_{t+i} - I_{t+i}]$

- $CA_t = r\,B_{t-1} + Y_t - C_t - G_t - I_t$

**Impact on Current Account**

- If $\rho = 0$, then $I_t \leftrightarrow$, $Y_{t+1} \leftrightarrow$, but $Y_t \uparrow > C_t \uparrow \rightarrow CA_t \uparrow$
- If $\rho = 1$, then $I_t \uparrow$, $I_{t+1} \leftrightarrow$, and $K_t \uparrow \rightarrow Y_{t+1} \uparrow\uparrow$ and forever

  As $Y_{t+1} \uparrow > Y_t \uparrow \rightarrow C_t \uparrow > Y_t \uparrow \rightarrow CA_t \downarrow$ both because $C_t \uparrow$ and $I_t \uparrow$
- If $0 < \rho < 1$ there exists $\rho > \bar{\rho}$ such that $C_t \uparrow + I_t \uparrow > Y_t \uparrow \rightarrow CA_t \downarrow$
- **The more persistent productivity shocks the worse the impact on the $CA_t$**

# Evidence on Productivity Shocks



- **Glick and Rogoff (JME 1995)** look at the evidence on the effects of productivity shocks for G-7 countries by estimating:
  - $\Delta I_t = a_0 + a_1 \Delta A_t^C + a_2 \Delta A_t^W + u_{It}$ (1)
  - $\Delta CA_t = b_0 + b_1 \Delta A_t^C + b_2 \Delta A_t^W + u_{CAt}$ (2)

where superscript $C$ stands for country-specific shock and $W$ for global shocks.

- As productivity shocks appear to be permanent in the data, i.e. $\rho = 1$, the intertemporal-approach model predicts that:
  - $H_0$: $a_1 > 0$; $b_1 < 0$; $|b_1| > a_1$ stronger effect on $CA_t$ vs $I_t$ as $C_t > Y_t$
- Glick and Rogoff find
  - $\hat{a}_1 > 0$; $\hat{b}_1 < 0$ but hypothesis $|b_1| > a_1$ is rejected.
- However, this is consistent with the perception of persistent but temporary shocks, i.e. $\bar{\rho} < \rho < 1$, that lead $C_t \uparrow < Y_t \uparrow$ and $CA_t$ fall but by less than the increase in $I_t$.

# Evidence on Output Shocks



**Kraay and Ventura (QJE 2000)** argue that output shocks may have any effect on $CA_t$, even if $\rho = 0$ because **output shocks increase saving $S_t$ that is invested in domestic assets, $K_t$, and foreign assets, $B_t$, so as to keep their shares constant in the portfolio.**

Noting that $S_t = I_t + CA_t$ and $\Delta I_t = \Delta K_t$ and $\Delta CA_t = \Delta B_t$ then the rule is:

- $\Delta CA_t = \Delta B_t = \dfrac{B_{t-1}}{K_{t-1}+B_{t-1}} \Delta S_t$ fraction of $S_t$ invested in **foreign** assets
- $\Delta I_t = \Delta K_t = \dfrac{K_{t-1}}{K_{t-1}+B_{t-1}} \Delta S_t$ fraction of $S_t$ invested in **domestic** assets
- $CA_t$ worsens in debtor countries with $B_{t-1} < 0$; i.e. a share $> 1$ of $\Delta S_t$ is used to finance $\Delta I_t$

Intuition: consider $F'(K_t)E_t A_{t+1} = r + p_t$ with $\rho = 0 \rightarrow E_t A_{t+1} = \bar{A}$

If $p_t$ falls in good times when $\Delta S_t > 0$ (and $\Delta$wealth >0), then $K_t$ increases.

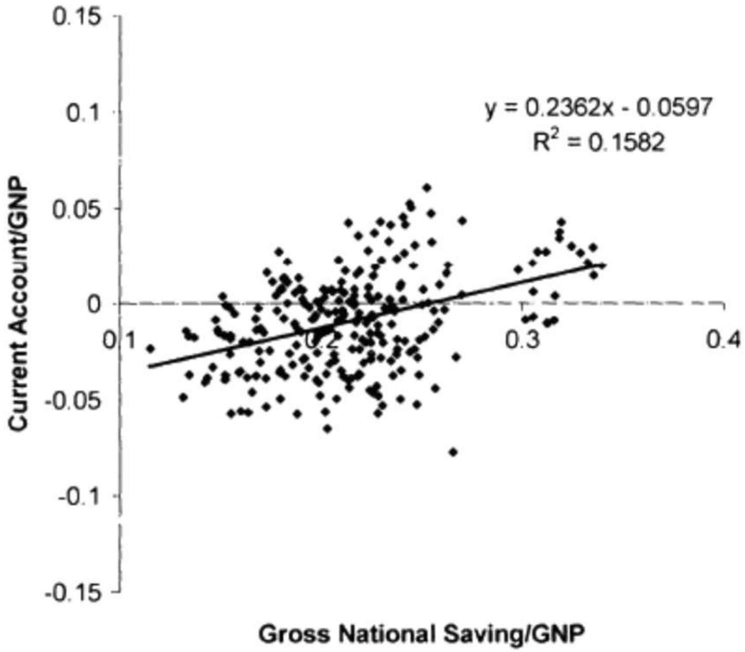
This theory requires weak diminishing returns and a significant $p_t$ (high investment risk), i.e. a strong preference for holding a diversified portfolio.

# Evidence of portfolio effect in CA determination 13 industrial countries – 1973-1995



**Traditional Rule with $\rho = 0$**

$$\Delta CA_t = \Delta S_t$$




**Kray-Ventura Rule**

$$\Delta CA_t = \frac{B}{K+B}\,\Delta S_t$$