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New Open-Economy Macroeconomics

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Plan of talk

- **introduction**

1. **NNS** in *closed* economy

2. Obstfeld-Rogoff (1995) **redux** model
    1. motivation and specification
    2. *log-linear* approximation to a steady state
        - *flexible*-price equilibrium
        - *sticky*-price equilibrium
    3. theoretical import and policy implications

3. **NOEM** in *open* economy
    1. dynamic NOEM
    2. stochastic NOEM

- **wrap-up**

Aim and learning outcomes

- **aim**: understand the rationale for, and key contributions of, the new open-economy macroeconomics (NOEM) research
- **learning outcomes**
  - motivate and summarise the **NNS** literature
  - derive and interpret the Obstfeld-Rogoff (1995) **redux** model
    - assess its methodological approach and analytical set-up
    - discuss its policy implications and empirical relevance
  - motivate and summarise the **NOEM** literature

New Neoclassical Synthesis (I)

- Goodfriend and King (1997), "The New Neoclassical Synthesis and the Role of Monetary Policy" NBER *Macroeconomics Annual*
- **macroeconomics:** often portrayed in *intellectual disarray*

  i.e., major and persistent *disagreements* about (i) methodology and (ii) substance
  - e.g., *flexible price* models of New Classicals and RBC analysis ⇒ monetary policy is essentially *unimportant* for real activity (money *neutrality*)
  - vs *sticky-price* models of New Keynesians ⇒ monetary policy is *central* to the evolution of real activity (*stabilisation* policy)

  => *policy advice*: controversial
- **the 1990s:** moving *toward* a **New Neoclassical Synthesis** (NNS)
- the *3 principles* of the **Neoclassical Synthesis (of the 1960s)**
  1. desire for *practical usefulness* /applicability/
  2. belief that economic fluctuations are caused by *short-run price stickiness*
  3. commitment to the ***micro****foundations* in modelling ***macro****behavior*

New Neoclassical Synthesis (II)

- the ***New* Neoclassical Synthesis** inherits the spirit of the *old*: it combines *Keynesian* and *classical* elements => common *methodological* ideas
  - systematic application of *intertemporal optimisation* and *rational expectations* as stressed by **Robert Lucas**
  - to the *pricing* and *output* decisions at the heart of **Keynesian** models (new and old) as well as to *consumption*, *investment* and *factor supply* decisions at the heart of **classical** models
  - and to the insights of **monetarists** (such as **Milton Friedman** and **Karl Brunner**) regarding the theory and practice of *monetary policy*
- **NNS models** are *complex*, with *6* main *ingredients*:
  1. intertemporal optimisation
  2. rational expectations
  3. monopolistic competition
  4. costly price adjustment
  5. dynamic price setting
  6. an important role for monetary policy

Obstfeld-Rogoff "redux" model: motivation

- O-R (1995), "Exchange Rate Dynamics Redux", JPE
  - could be viewed as **extending to an *open*-economy setting** the main ideas of the **NNS** literature for a *closed* economy
  - and as **providing microfoundations to the Mundell-Fleming-Dornbusch tradition** of open-economy analysis under *sticky* prices
- Dornbusch (1976) extension of the Mundell-Fleming model suffers, on a theoretical plane, from at least **3 drawbacks**
  1. lack of *explicit choice-theoretic foundations*, in particular, of AS (or output) => cannot predict how incipient gaps b/n AD and output are resolved when prices are set in advance and fail to clear markets
  2. does not account for private or government *intertemporal budget constraints* => ill-equipped to capture CA dynamics or the effects of government spending
  3. the lack of microfoundations deprives it of any *natural welfare metric* by which to evaluate alternative macroeconomic policies
- O-R "redux" **addresses** essentially these 3 kinds of failure

Redux: general set-up

- **the *World***
  - a continuum of agents on the *unit* interval
  - each the *monopolistic* producer of a *single differentiated* good
- **two countries**
  - agents on the subinterval $i \in [0, n]$ reside in *Home*,
  - while agents $i^* \in (n, 1]$ live in *Foreign*

  $\Rightarrow$ n provides an index of the relative *size* of the two economies
- **endogeneity of output**
  - *no capital or investment*
  - yet this is not an endowment economy because *labour supply is elastic* (chosen in *individual intertemporal optimisation*)

Redux: preferences, Dixit-Stiglitz indexes

- *identical* across agents + *symmetric* across countries =
  = **representative agent** (national *consumer-producers*)
- *intertemporal* **utility** of *Home* agent $j \in [0, n]$

$$U^j \equiv \sum_{t=0}^{\infty} \beta^t \left\{ \ln c_t^j + \chi \ln \frac{M_t^j}{P_t} - \frac{\kappa}{2} \left(y_t^j \right)^2 \right\}$$

$$c^j \equiv \left[\int_0^n \left(c_i^j \right)^{\frac{\theta-1}{\theta}} di + \int_n^1 \left(c_{i^*}^j \right)^{\frac{\theta-1}{\theta}} di^* \right]^{\frac{\theta}{\theta-1}}$$

$$P \equiv \left[\int_0^n \left(P_i \right)^{1-\theta} di + \int_n^1 \left(P_{i^*} \right)^{1-\theta} di^* \right]^{\frac{1}{1-\theta}}$$

Redux: money, disutility of effort

- agents hold **real money balances**
  - of the *domestic* currency *only*
  - *MiU motive*: new, vs ad-hoc models and CiA in Lucas (1982)
- **disutility of effort** (or, implicitly, *utility of leisure*)
  - given by $-\phi l$ with a *production function* $y=Al^{\alpha}$, where $0<\alpha<1$
  - to see it, let $\kappa = \frac{2\phi}{A^{\frac{1}{\alpha}}}$ =>

$$-\phi l = -\phi\left(\frac{y}{A}\right)^{\frac{1}{\alpha}} = -\frac{\phi}{A^{\frac{1}{\alpha}}}y^{\frac{1}{\alpha}} = -\frac{1}{2}\frac{2\phi}{A^{\frac{1}{\alpha}}}y^{\frac{1}{\alpha}} = -\frac{1}{2}\kappa y^{\frac{1}{\alpha}} = -\frac{\kappa}{2}y^{\frac{1}{\alpha}}$$

  - and let $\alpha=0.5$ => $-\frac{\kappa}{2}y^{\frac{1}{\alpha}} = -\frac{\kappa}{2}y^{2}$
  - NB: a *rise* in *productivity A* is captured by a *fall* in κ!

Redux: LOP => consumption-based PPP

- **LOP:** $\frac{P_i}{S} = P_i^*$ and $P_{i^*} = SP_{i^*}^*$
- *consumption-based* (microfounded) **PPP:** $P = SP^*$

$$P = \left[\int_0^n (P_i)^{1-\theta} di + \int_n^1 (SP_{i^*}^*)^{1-\theta} di^* \right]^{\frac{1}{1-\theta}}$$

$$P^* = \left[\int_0^n \left(\frac{P_i}{S} \right)^{1-\theta} di + \int_n^1 (P_{i^*}^*)^{1-\theta} di^* \right]^{\frac{1}{1-\theta}}$$

Redux: bonds only, budget constraints

- **individual** *period* BC (in *real* terms)

$$c_t^j + \frac{M_t^j}{P_t} + \tau_t + b_{t+1}^j \leq \frac{P_{jt}}{P_t} y_t^j + (1 + r_t) b_t^j + \frac{M_{t-1}^j}{P_t}$$

$$c_t^j + \frac{M_t^j}{P_t} + \tau_t + b_{t+1}^j \leq \frac{P_{jt}}{P_t} y_t^j + (1 + r_t) b_t^j + \frac{1}{1+\pi_t} \frac{M_{t-1}^j}{P_{t-1}}$$

- **government** *period* BC (in *real* terms)

$$0 = \tau_t + \frac{M_t - M_{t-1}}{P_t}$$

Redux: demand curve facing each monopolist

- maximising $c = \left[\int_0^1 (c_z)^{\frac{\theta-1}{\theta}} dz \right]^{\frac{\theta}{\theta-1}}$ s.t. $\int_0^1 P_z c_z dz = Z$

$$c_z = \left(\frac{P_z}{P_{z'}} \right)^{-\theta} c_{z'} \qquad c_z = \left(\frac{P_z}{P} \right)^{-\theta} \frac{Z}{P} = \left(\frac{P_z}{P} \right)^{-\theta} c$$

$$c_z^j = \left(\frac{P_z}{P} \right)^{-\theta} c^j \qquad c_z^{j*} = \left(\frac{P_z^*}{P^*} \right)^{-\theta} c^{j*}$$

$$y_z^d = \left(\frac{P_z}{P} \right)^{-\theta} c^W \qquad c^W \equiv \int_0^n c_z^j dz + \int_n^1 c_z^{j*} dz = nc + (1-n)c^*$$

Redux: unconstrained optimisation => FONCs

$$\max_{y_t^j, M_t^j, b_t^j} U_t^j = \sum_{t=0}^{\infty} \beta^t \left\{ \ln \underbrace{\left[(1+r_t) b_t^j + \frac{M_{t-1}^j}{P_t} + \left(y_t^j\right)^{\frac{\theta-1}{\theta}} (c_t^W)^{\frac{1}{\theta}} - \tau_t - b_{t+1}^j - \frac{M_t^j}{P_t} \right]}_{c_t} + \right.$$

$$\left. + \chi \ln \frac{M_t^j}{P_t} - \frac{\kappa}{2}\left(y_t^j\right)^2 \right\}$$

$$b_t^j : \quad c_{t+1}^j = \beta(1+r_{t+1}) c_t^j \Leftrightarrow \frac{c_{t+1}^j}{c_t^j} = \beta(1+r_{t+1})$$

$$y_t^j : \quad \kappa y_t^j = \frac{\theta-1}{\theta} \frac{1}{c_t^j} \left(\frac{y_t^j}{c_t^W} \right)^{-\frac{1}{\theta}} \Leftrightarrow \left(y_t^j\right)^{\frac{\theta+1}{\theta}} = \frac{\theta-1}{\kappa\theta} \frac{1}{c_t^j} (c_t^W)^{\frac{1}{\theta}}$$

$$M_t^j : \quad \frac{M_t^j}{P_t} = \chi c_t^j \frac{1+\iota_{t+1}}{\iota_{t+1}} \Leftrightarrow \frac{P_t}{M_t^j} = \frac{1}{\chi} \frac{1}{c_t^j} \frac{\iota_{t+1}}{1+\iota_{t+1}}, \qquad 1+\iota_{t+1} = \frac{P_{t+1}}{P_t}(1+r_{t+1})$$

Redux: TVC and market clearing

- TVC

$$\lim_{T\to\infty} \underbrace{\prod_{v=t+1}^{T} \frac{1}{(1+r_v)}}_{} \left(b_{t+T+1} + \frac{M_{t+T}}{P_{t+T}} \right) = 0$$

$\equiv R_{t,t+T}^{-1}$: *market discount factor* for date T consumption on date $t<T$

- *money* market clearing in H and in F
- global *bond* market clearing

$$nb_{t+1} + (1-n)b_{t+1}^{*} = 0$$

- global *goods* market clearing

$$c_t^W \equiv nc_t + (1-n)c_t^{*} = n\frac{P_{Ht}}{P_t}y_{Ht} + (1-n)\frac{P_{Ft}^{*}}{P_t^{*}}y_{Ft}^{*} \equiv y_t^W$$

Redux: a steady state to linearise around

- because of *monopoly pricing* and *endogenous output*, **no closed-form solution** for *general* paths of *exogenous* (policy) variables

$\Rightarrow$ to analyse effects of *exogenous* (*money supply*, in redux) *shocks*

  – either *simulate numerically*

  – or *examine a linearised version* of the equilibrium of the model $\Rightarrow$

- **to linearise** the above system of eqs, one needs to find a well-defined *flex-price SS* around which to approximate $\Rightarrow$

  – most *convenient* SS: *all exogenous variables are constant*

  $\Rightarrow$ *consumption* (and output) *constant* in this SS $\Rightarrow$ *RIR* tied down by consumption Euler equation: $r = \frac{1-\beta}{\beta} \equiv \delta = const$

  – *in a symmetric SS*, *H* representative agent's BC reduces to: $c = \frac{P_H}{P} y_H + \delta b$

  i.e.,, *real consumption* = *real income* (output sold + income from NFA)

  – from bond-market clearing, determine $b^* = -\frac{n}{1-n} b$ and $c^* = \frac{P_F^*}{P^*} y_F^* - \frac{n}{1-n} \delta b$

  – in general, no closed-form solution for this SS, but one exists for *initial b=0*

Redux: linearised system

- expressed in terms of **percentage deviations** *around the SS* (described above)
  - with each *hatted* variable (below) defined as $\widehat{x}_t \equiv d\ln x_t \equiv \ln \frac{x_t}{x_0}$
  - where x_0 is its *initial SS* value
- *11* eqs, *11 endogenous* vars: $(\widehat{y}_t, \widehat{y}_t^*)$; $\left(\widehat{c}_t, \widehat{c}_t^*, \widehat{c}_t^W\right)$; $\left(\widehat{P}_{Ht}, \widehat{P}_t, \widehat{P}_{Ft}^*, \widehat{P}_t^*, \widehat{S}_t\right)$; $(\widehat{r}_{t+1})$.

$$\widehat{P}_t = n\widehat{P}_{Ht} + (1-n)\left(\widehat{S}_t + \widehat{P}_{Ft}^*\right), \qquad \widehat{P}_t^* = n\left(\widehat{P}_{Ht} - \widehat{S}_t\right) + (1-n)\widehat{P}_{Ft}^*$$

$$\widehat{y}_t = \theta\left(\widehat{P}_t - \widehat{P}_{Ht}\right) + \widehat{c}_t^W, \qquad \widehat{y}_t^* = \theta\left(\widehat{P}_t^* - \widehat{P}_{Ft}^*\right) + \widehat{c}_t^W$$

$$n\widehat{c}_t + (1-n)\widehat{c}_t^* = \widehat{c}_t^W \equiv n\widehat{y}_t + (1-n)\widehat{y}_t^* = \widehat{y}_t^W$$

$$\widehat{c}_{t+1} = \widehat{c}_t + \tfrac{\delta}{1+\delta}\widehat{r}_{t+1}, \qquad \widehat{c}_{t+1}^* = \widehat{c}_t^* + \tfrac{\delta}{1+\delta}\widehat{r}_{t+1}$$

$$(\theta+1)\widehat{y}_t = -\theta\widehat{c}_t + \widehat{c}_t^W, \qquad (\theta+1)\widehat{y}_t^* = -\theta\widehat{c}_t^* + \widehat{c}_t^W$$

$$\widehat{M}_t - \widehat{P}_t = \widehat{c}_t - \tfrac{\widehat{r}_{t+1}}{1+\delta} - \tfrac{\widehat{P}_{t+1} - \widehat{P}_t}{\delta}, \qquad \widehat{M}_t^* - \widehat{P}_t^* = \widehat{c}_t^* - \tfrac{\widehat{r}_{t+1}}{1+\delta} - \tfrac{\widehat{P}_{t+1}^* - \widehat{P}_t^*}{\delta}, \quad \widehat{S}_t = \widehat{P}_t - \widehat{P}_t^*$$

Flex-price redux: classical dichotomy

- to analyse welfare implications of **MonPol**, define it as *one-time (permanent) unanticipated change in (the level of) nominal MS*
- **classical** *real-monetary* **dichotomy** (as in the *closed*-economy case) evident from the structure of redux
  - with *prices* and *NER* free to adjust immediately to changes in either *H* or *F* MS, equilibrium values of all *real* variables can be determined independently of MS and MD (i.e., *nominal*) factors:
  - price eqs in linearised system imply $n\left(\widehat{P}_{Ht} - \widehat{P}_t\right) + (1-n)\left(\widehat{P}^*_{Ft} - \widehat{P}^*_t\right) = 0$
  - and then this latter eq plus world demand, world consumption, optimal individual consumption and labour-leisure schedules suffice to determine *real equilibrium*, while MDs determine *price paths* and PPP *NER*!

Flex-price redux: exchange-rate dynamics

- subtracting MDs: $\widehat{M}_t - \widehat{M}_t^* - \widehat{S}_t = (\widehat{c}_t - \widehat{c}_t^*) - \frac{1}{\delta}\left(\widehat{S}_{t+1} - \widehat{S}_t\right)$
- and solving forward for NER (in the *no-bubbles* case):

$$\widehat{S}_t = \frac{\delta}{1+\delta} \sum_{s=0}^{\infty} \left(\frac{1}{1+\delta}\right)^s \left[\left(\widehat{M}_{t+s} - \widehat{M}_{t+s}^*\right) - (\widehat{c}_{t+s} - \widehat{c}_{t+s}^*)\right]$$

- but from consumption Euler eqs it follows that:

$$\widehat{c}_{t+s} - \widehat{c}_{t+s}^* = \ldots = \widehat{c}_{t+2} - \widehat{c}_{t+2}^* = \widehat{c}_{t+1} - \widehat{c}_{t+1}^* = \widehat{c}_t - \widehat{c}_t^*, \qquad s > t$$

- hence: $\widehat{S}_t = -(\widehat{c}_t - \widehat{c}_t^*) + \frac{\delta}{1+\delta} \sum_{s=0}^{\infty} \left(\frac{1}{1+\delta}\right)^s \left(\widehat{M}_{t+s} - \widehat{M}_{t+s}^*\right)$
  - because agents are *forward-looking*, only the *PDV* of *relative* MS matters for the *equilibrium* NER
  - in other words, the SS NER only depends on "the *permanent* MS differential": analogy with *PIH* of Friedman (1957) and Hall (1978)!

Flex-price redux: NER prediction

- *another* parallel, to the **monetary model** NER eq:
  let $\widehat{f}_{t+s} \equiv \left(\widehat{M}_{t+s} - \widehat{M}^{*}_{t+s}\right) - \left(\widehat{c}_{t+s} - \widehat{c}^{*}_{t+s}\right)$ => $\widehat{S}_t = \frac{\delta}{1+\delta}\sum_{s=0}^{\infty}\left(\frac{1}{1+\delta}\right)^s \widehat{f}_{t+s}$
- rearranging, *still another* use: make **NER predictions**

$$\widehat{S}_{t+1} - \widehat{S}_t = -\frac{\delta}{1+\delta}\left[\left(\widehat{M}_t - \widehat{M}^{*}_t\right) - \frac{\delta}{1+\delta}\sum_{s=0}^{\infty}\left(\frac{1}{1+\delta}\right)^s\left(\widehat{M}_{t+1+s} - \widehat{M}^{*}_{t+1+s}\right)\right]$$

  - if **current** value of *MS differential* ***high*** w.r.t. **permanent** one
  - $\widehat{S}_{t+1} < \widehat{S}_t$ => NER↓ (*home* currency will ***appreciate***)!
- an *explicit solution* for NER can be obtained if **specific processes** for the nominal MSs are assumed
  - simplest: constant, deterministic growth paths in both countries, e.g.,

$$\widehat{M}_t = \widehat{M}_0 + \mu t \text{ and } \widehat{M}^{*}_t = \widehat{M}^{*}_0 + \mu^{*} t$$

  - but … limitations (because of defining vars as deviations around a SS)

Sticky-price redux: rationale for and specification of nominal rigidities

- as in closed economies, *flex-price models* of open economies appear *unable* to replicate **size and persistence effects** of monetary shocks on real variables
- and just as with closed-economy models, this can be remedied by the *introduction of* **nominal rigidities**
- redux assumes a simple **pricing rule**
  - domestic-currency *prices* of *domestically produced goods* are *set* **one period in advance** and *stay fixed for just one period*
  - thereafter they *adjust completely* and both economies return to their SS
  - but *during* the (one) period in which prices are *fixed*, real output and consumption levels are affected by (unexpected) monetary shocks
  - *presence of nominal rigidities leads to real effects of monetary disturbances*
    - through the channels known from closed-economy models
    - but now also through a *new channel*!

Sticky-price redux: new channel of monetary transmission

- although ***domestic output price*** indexes P_H and P_F^* are *preset*
- ***aggregate price level*** indexes in each country P and P^* *fluctuate* with *NER S*
- nominal depreciation, $S\uparrow$, raises the domestic general price level, $P\uparrow$

↔ NB: *no distinction* was made in closed-economy models b/n these two types of price indexes (e.g., *GDP deflator* vs *CPI*)

⇒ a *new* channel of monetary transmission relative to closed economy

- *NER movements* alter the domestic currency price of foreign goods, allowing *CPI to move in response to monetary disturbances*, *even* in the presence of nominal rigidities

↔ with nominal stickiness, the price level could not adjust immediately in a closed economy!

Sticky-price redux: specification of a monetary shock

- in period *t, H MS rises unexpectedly relative to F MS*
- to smooth consumption, *H* agents *lend*, and *H* thus runs a *CAS*
- this alters *the NFA position* of the *two* economies and can affect *the new SS equilibrium*!
- it follows from the consumption Euler eqs that $\hat{c}_{t+1} - \hat{c}^*_{t+1} = \hat{c}_t - \hat{c}^*_t$
- and since the economies are in the new SS after *1* period, at *t+1*
- $\hat{c}_{t+1} - \hat{c}^*_{t+1} \equiv \Theta = const$ is the **SS consumption differential**
- but since we also have that $\hat{c}_t - \hat{c}^*_t = \hat{c}_{t+1} - \hat{c}^*_{t+1} = \Theta$
- these relationships imply that relative consumption in the two economies **immediately jumps** in period *t* to the new SS value!

Sticky-price redux: monetary policy, exchange-rate dynamics and welfare

- *relative MD* can now be written: $\widehat{M}_t - \widehat{M}_t^* - \widehat{S}_t = -\Theta - \frac{1}{\delta}\left(\widehat{S}_{t+1} - \widehat{S}_t\right)$
- and solving forward for NER (in the *no-bubbles* case):

$$\widehat{S}_t = -\Theta + \frac{\delta}{1+\delta} \sum_{s=0}^{\infty} \left(\frac{1}{1+\delta}\right)^s \left(\widehat{M}_{t+s} - \widehat{M}_{t+s}^*\right)$$

- if one assumes, as before, that the change in relative MS is a *permanent one-time change*, then $\widehat{M}_{t+s} - \widehat{M}_{t+s}^* \equiv \Omega = const$
- so NER becomes $\widehat{S}_t = \Omega - \Theta = const$
- this implies that NER **jumps immediately** to its new SS!
- for this reason, we do **not** observe exchange rate **overshooting**, as in the Dornbusch (1976) model we studied in lecture 6

Sticky-price redux: without and with relative consumption adjustment

- if *relative consumption* levels did *not adjust* (i.e., if $\Theta=0$)
  - then the permanent change in NER is *just equal* to the relative change in nominal MSs, Ω, and *H* MS↑ relative to *F* MS (i.e., $\Omega>0$) produces a home currency depreciation!

↓↑

- if $\Theta\neq 0$, then *changes in relative consumption affect relative MD*, from MD eqs:
  - e.g., if $\Theta>0$, consumption as well as MD in *H* is higher then initially, and then *equilibrium b/n H MS and MD* can be restored with a *smaller* increase in *H* price level: since P_H and P_F^* are fixed, the increase in *P* necessary to maintain real MD and real MS equilibrium is generated by a *depreciation* (S↑); the larger the rise in *H* consumption, the larger is the rise in *H* MD, and the smaller is the necessary rise in *S*!

Sticky-price redux: role of endogenous consumption differential

- with ***endogenous*** *real consumption differential*
  - several steps are needed to determine its value
  - we would not have time to follow them here (see O-R, chapter 10)
- **key conclusion** is that
  - an unexpected *H* monetary expansion
  - leads to a *H* currency depreciation that is *less* than proportional to it
  - which induces *expansion in both domestic production and consumption*
  - as consumption rises by *less* than income, *H runs a CAS (lends)* and *accumulates NFA* (claims against future income of *F*)
  - this allows *H* to maintain ***higher consumption forever!!!***

Redux summary: theoretical import

- introducing ***micro*****foundations and *****nominal***** rigidities** within a traditional *open*-economy framework
- hence, the *responses* of consumption, output (and therefore, the current account), interest rates and the exchange rate *to a monetary shock* are ***consistent with*** **optimising behaviour**
- thus, allowing for **explicit welfare analysis** of *alternative* monetary and exchange-rate *policies*

Redux summary: main result and transmission mechanism

- an *unanticipated* monetary disturbance can have a permanent impact on real consumption levels and, hence, welfare (explicitly in the utility) *when prices are preset:* **monetary expansion increases welfare!**
- $M\uparrow$ (money *surprise*) $\rightarrow$ $S\uparrow$ (depreciation) and $P\uparrow$ (inflation) $\rightarrow$ $y\uparrow$ and $c\uparrow$ (but *less* than *y,* because *c* is determined on the basis of *PI*) $\Rightarrow$ CAS (net exports: the excess of output over consumption is exported) $\Leftrightarrow$ (lending abroad $\equiv$ accumulating foreign bonds, i.e.,, claims on future foreign output, as payment for exports) $\Rightarrow$ *welfare (consumption in the utility) rises permanently, even though the increase in output lasts only one period, as H PI has risen by the annuity value of its claim on future foreign output!* $\Rightarrow$ **incentives for monetary expansion!**

Redux summary: policy implications

- **policy coordination:**
  - a joint proportionate expansion leaves $\widehat{M} - \widehat{M}^*$, NER and thus $\widehat{c} - \widehat{c}^*$ unchanged
  - but since output is inefficiently low with *monopolistic competition*, both countries have incentive to expand $\Rightarrow$ *steady* inflation $\rightarrow$ *no* welfare gains!
- ***small* open-economy case** (*n* is very *low*)

  $\Rightarrow$ *foreign* variables are now *exogenous*

  $\rightarrow$ float vs peg matters: choice of exchange rate regime influences the way in which disturbances affect the small economy!

NOEM (I)

- New Open-Economy Macroeconomics (NOEM): **key ingredients**
  - DGEMs with well specified microfoundations
  - market imperfections
    - monopolistic competition
    - nominal rigidities
- why **imperfect competition**
  - permits explicit analysis of price-setting decisions
  - equilibrium prices set above marginal costs rationalise demand-determined output (for small shocks)
  - with monopoly power, equilibrium production is below social optimum => distortion to be potentially corrected by activist intervention (monetary policy)
- **attractions** of NOEM
  - clarity and analytical rigor: explicit U and Π max problems
  - welfare metric => credible welfare analysis and policy evaluation
  - role for monetary policy => focus on monetary shocks: sharpens understanding of nominal rigidities, the disturbance flex-price models are least equipped to handle

NOEM (II)

- **Dynamic** NOEM redux extensions
  - Betts-Devereux: pricing to market (PTM)
  - Corsetti-Pesenti: low (unit) cross-country substitutability
  - Devereux-Engel: price setting and exchange-rate regimes
- **Stochastic** NOEM redux extensions
  - Obstfeld-Rogoff directions for NOEM research: risk and space
  - Bacchetta-van Wincoop: early stochastic NOEM contributions
  - Mihailov: trade costs and inelastic import demand
  - Singh: asset structure and intermediate goods

Concluding wrap-up

- **What have we learnt?**
  – motivate and summarise the **NNS** literature
  – analyse the Obstfeld-Rogoff (1995) **redux** model
    - justify its methodological approach and analytical set-up
    - derive and interpret its main theoretical results
    - assess its policy implications and empirical relevance
  – motivate and summarise the **NOEM** literature
- **Where we go next**: to Jeanne-Rose (2002) model incorporating *irrational* behaviour via noise traders