ECON 6356
International Finance and Macroeconomics

Lecture 7: Local Currency Pricing, Deviations from PPP, and Expenditure Switching

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Introduction

Previous LOE models worked under the assumption of full passthrough from the ER to prices with Producer Currency Pricing. However, there is little empirical support for these assumptions.

Here, we explore the consequences of assuming Local Currency Pricing as an alternative environment.

LCP: firms set different prices for the each location where their goods are sold.

For example, a local firm would charge a local price in dollars, and another price in a foreign market. (with a dollar value that does not coincide with the home dollar price.)

To begin, we cover Betts and Devereux (2000) (henceforth BD) where a framework with a varying degree of LCP is considered. Then, we move to Chari, Kehoe, and McGrattan (2002) (CKM) to study the quantitative implications of a modeling framework with a full degree of LCP.

Introduction (cont.)

BD2000 develop a version of the OR95 model that allows for pricing to market in the form of firms setting prices in the currency of consumers: **local currency pricing (LCP)**.

They assume firms segment markets by country. Now, they also must assume sticky prices, otherwise, LCP is equivalent to PCP. With these two additions the **PPP won't hold** ($\bar{P} \neq \varepsilon \bar{P}^*$, where a bar denotes a constant).

Note: The authors refer to the pricing as Pricing To Market which is a more general concept, used more traditionally to refer to situations where setting different prices in different markets generates deviations from the law of one price under flexible prices.

For example in the case where different elasticity of substitutions among goods differ between home and foreign consumers resulting in a structural reason for different prices of the same good in different locations.

Implications of LCP (in terms of previous results):

- One consequence of the LCP setup is that it increases the ER volatility.

- LCP affects the transmission of policy shocks and their welfare implications.

- Monetary policy becomes Beggar Thy Neighbor

- The higher the degree of LCP pricing:

    - The lower the comovement in consumption across countries

    - But the higher the comovement of output.

Model

- Two countries

- Continuum of goods $z \in [0, 1]$

- Monopolistic competition; n firms in home, $(1 - n)$ firms abroad.

Preferences:

$$U_t = \sum_{s=t}^{\infty} \beta^{s-t} \left[\log C_s + \frac{\chi}{1-\lambda} \left(\frac{M_s}{P_s}^{1-\lambda} \right) + \eta \log(1 - L_s) \right],$$

where $1 - L_s$ denotes leisure, L_t denotes hours worked and the consumption basket C_t is given by a bundle of consumed varieties:

$$C_t = \left[\int_0^1 (c_t(z))^{\frac{\theta-1}{\theta}} dz \right]^{\frac{\theta}{\theta-1}}, \quad \theta > 1,$$

where there is only one meaningful elasticity of substitution θ

As in OR95 the elasticity of substitution between country-specific varieties is the same as that within country varieties. $\text{ES}_{\text{within}} = \text{ES}_{\text{within}} > 1$.

Prices

A key difference is that a fraction α of the firms can segment markets by country (LCP) while the remainder goods can be freely traded by consumers (LOP)

α: LCP share

$$P_t = \left[\overbrace{\int_0^1 (p_t(z))^{1-\theta} dz}^{\text{home varieties}} + \overbrace{\int_n^{(1-n)\alpha} (p_t^*(z))^{1-\theta}}^{\text{foreign varieties with LCP}} + \overbrace{\int_{n+(1-n)\alpha}^1 (\varepsilon_t q_t^*(z))^{1-\theta} dz}^{\text{foreign varieties with LOP/PCP}} \right],$$

where $p_t^*(z)$ is the home currency price of a foreign LCP good z and $q_t^*(z)$ is the foreign currency price of a foreign PCP good z.

An analogous price basket expression holds for the foreign households (P_t^*).

Optimal demands for each type of good:

$$c_t(z) = \begin{cases} \left(\frac{p_t(z)}{P_t}\right)^{-\theta} C_t & \text{if } z \in [0, n) \\ \left(\frac{p_t^*(z)}{P_t}\right)^{-\theta} C_t & \text{if } z \in (n, n + (1-n)\alpha) \\ \left(\frac{\varepsilon_t q_t(z)^*}{P_t}\right)^{-\theta} C_t & \text{if } z \in (n + (1-n)\alpha, 1] \end{cases}$$

Budget constraint

$$P_tC_t + M_t + d_tB_t = W_th_t + \Pi_t + M_{t-1} + T_t + B_{t-1},$$

where B_{t-1} is holdings of a bond denominated in home currency, d_t is the price of the bond (inverse of one plus interest rate), and Π_t are the profits from the firm ownership.

The home-currency denominated bond is the only asset traded internationally.

T_t is a lump-sum tax transfer and satisfy a government balanced budget constraint given by: $P_tG_t + T_t = M_t - M_{t-1}$ where G_t is a wasteful government consumption, with the same composition as C_t and similar government demands for individual goods' varieties.

Note: Unlike before, here it is important that for the bond not to be denominated in units of consumption since LCP will result in PPP deviations and a real interest rate differential across countries, which, given identical consumption baskets could not manifest if real bods are denominated in units of consumption.

Production and pricing by firms

The production is linear in labor.

Price setting, under flexible prices by a LCP home firm z choosing $p_t(z)$ and $q_t(z)$ to maximize profit yields:

$$p_t(z) = \varepsilon q_t(z) = \frac{\theta}{\theta - 1} W_t.$$

And clearly, a PCP home firm z' will choose the same markup over marginal cost and have the price abroad determined by the LOP.

Hence, PPP holds under flexible prices in BD2000.

No deviation of LOP under flexible prices and LCP

Export price index

$$\Gamma_t = \left[\int_0^{(1-\alpha)n} (p_t(z))^{1-\theta} + \int_{(1-\alpha)n}^{n} (\varepsilon_t q_t(z))^{1-\theta} dz \right]^{\frac{1}{1-\theta}}.$$

Thus, of the n goods produced and exported by home, $(1-\alpha)n$ are priced in home currency and αn are priced in foreign currency.

An analogous definition for Γ_t^* follows and the terms-of-trade are

$$TOT_t \equiv \frac{\Gamma}{\varepsilon \Gamma^*}$$

Sticky prices

The same 1-period price stickyness as in OR95 is assumed. This is combined with a partial degree of LCP.

For PCP firms the LOP holds; for LCP firms shocks in the ER cause deviations from LOP in the short run.

Output is then demand-determined during the period in which pre-set prices are in place. As in the two previous models, the economy converges to its new long-run equilibrium in the period $t+1$ after a shock in t.

Same problem of steady-state indeterminacy and non-stationary with the OR setup $\Rightarrow$ **there is a transition between steady states after a shock.**

Use as before sans serif fonts to denote percentage deviations from the initial, symmetric, steady state with zero assets.

Let: $\mathsf{B}_t \equiv \mathsf{d}B_t/(\bar{P}\bar{C}^W),\ \mathsf{G}_{t+1} \equiv \mathsf{d}G_t/(\bar{C}^W),\ \mathsf{G}^*_{t+1} \equiv \mathsf{d}G^*_t/(\bar{C}^W)$

Sticky prices (cont.)

Long-run responses:

$t+1$ responses of the ER and consumption differential to shocks are,

$$\mathsf{e}_{t+1} = \mathsf{M}_{t+1} - \mathsf{M}^*_{t+1} - \frac{1}{\lambda}(\mathsf{C}_{t+1} - \mathsf{C}^*_{t-1}), \tag{1}$$

$$\mathsf{C}_{t+1} - \mathsf{C}^*_{t+1} = \frac{\theta - 1 + \eta}{\theta - 1 + \theta\eta}\left[\frac{1-\beta}{1-n}\mathsf{B}_t - \mathsf{G}_{t+1} - \mathsf{G}^*_{t+1}\right]. \tag{2}$$

The first equation follows from equilibrium in money markets.

The second one, states that for a given government expenditure, a trade surplus in the short run ($\mathrm{d}B_t > 0$) generates a positive consumption differential in the long-run (as in OR95).

Sticky prices (cont.)

Short-run responses:

$$\mathsf{e}_t(1-\alpha) = \mathsf{M}_t - \mathsf{M}_t^* - \frac{1}{\lambda}(\mathsf{C}_t - \mathsf{C}_t^*) - \frac{1}{\lambda\delta}(\mathsf{e}_t - \mathsf{e}_{t+1}),$$

where δ is the discount rate as in OR95. We can note that the short-run response in OR is the same if $\lambda = 1$ —log disutility— and $\alpha = 0$ —no LCP.
(in OR SR response is $\mathsf{e} = \mathsf{M} - \mathsf{M}^* - (\mathsf{C} - \mathsf{C}^*) + (1/\delta)(\bar{\mathsf{e}} - \mathsf{e})$)

The Euler equations yield,

$$\mathsf{C}_t - \mathsf{C}_t^* = \mathsf{C}_{t+1} - \mathsf{C}_{t+1}^* + \alpha \mathsf{e}_t \tag{3}$$

Intuition: PPP does not hold as long as $\alpha > 0$. Then, the real interest rates will differ across countries, and in consequence, there will be a corresponding difference in rates of growth of consumption, despite the presence of free trade of assets (nominal bond).

Sticky prices (cont.)

Replacing e_{t+1} from (1) in the short-run equation for e_t

$$e_t(1-\alpha) = M_t - M_t^* - \frac{1}{\lambda}(C_t - C_t^*) - \frac{1}{\lambda\delta}\left(e_t - \left(M_{t+1} - M_{t+1}^* - \frac{1}{\lambda}(C_{t+1} - C_{t-1}^*)\right)\right),$$

Now substitute $C_{t+1} - C_{t+1}^*$ from (3) and solve for e_t

$$e_t\left(1 - \alpha + \frac{\lambda - \alpha}{\lambda^2\delta}\right) = \left(1 + \frac{1}{\lambda\delta}\right)(M_t - M_t^*) - \frac{1}{\lambda}\left(1 + \frac{1}{\lambda\delta}\right)(C_t - C_t^*).$$

From the price index formula we have that when $\alpha = 1$ (full LCP) the ER does not affect the price level. (full LCP & stickiness $\Rightarrow ER \perp P$)

If in addition, $\lambda = 1$ then the ER does not affect the nominal interest rate differentials and the ER will not have any effect altogether.

Disgression: UIP in the BD2000 model

We can recall that the nominal interest rate at home is: $1 + i_{t+1} = \frac{1}{d_t}$. Analogously, the foreign nominal interest rate (on bonds deminonated in home currency) is: $1 + i^*_{t+1} = \frac{\varepsilon_t}{\varepsilon_{t+1}} \frac{1}{d_t}$. Taking the ratio:

$$\frac{1 + i_{t+1}}{1 + i^*_{t+1}} = \frac{1/d_t}{(\varepsilon_t/dt)/\varepsilon_{t+1}} = \frac{\varepsilon_{t+1}}{\varepsilon_t}$$

Then, we have that the UIP holds in the BD model, and it can be verified that, if $\alpha = \lambda = 1$, the equilibrium interest rate differential is not affected by the ER movements.

Sticky prices (cont.)

Taking the log-linear versions of the balance of payment equations and using the market clearing conditions,

$$\mathsf{e}_t = \frac{\mathsf{C}_t - \mathsf{C}_t^* + \frac{\beta}{1-n}\mathsf{B}_t + \mathsf{G}_t - \mathsf{G}_t^*}{(1-\alpha)(\theta-1)+\alpha}. \tag{4}$$

Intuition:

$\alpha = 0$ (PCP)	$\alpha = 1$ (LCP)
$\uparrow\varepsilon \rightarrow$ price of foreign goods ($\uparrow \varepsilon_t P_t^*$)	$\uparrow \varepsilon \rightarrow$ No effect on prices
Demand shifts toward home	But relative incomes still affected: income redistribution towards home
$\Rightarrow \uparrow$ production, $\uparrow C_t$	$\Rightarrow \uparrow$ production, $\uparrow C_t$

Thus, we get the same effect even without (relative) price changes. LCP only turns off the relative price effect but the relative income effect is present in both.

Sticky prices (cont.)

Finally, the solutions for the short-run ER and relative consumption are:

$$\mathsf{e}_t = \frac{\varphi\lambda(\mathsf{M}_t - \mathsf{M}_t^*) + \mathsf{G}_t - \mathsf{G}_t^* + \frac{1}{\delta}(\mathsf{G}_{t+1} - \mathsf{G}_{t+1}^*)}{(1-\alpha)(\lambda\varphi + \theta - 1) + \alpha\varphi\frac{1+1/\delta}{1+1/(\delta\lambda)}},$$

$$\mathsf{C}_t - \mathsf{C}_t^* = \left[\frac{(1-\alpha)(\theta-1)}{\varphi} + \alpha\right]\mathsf{e}_t + \frac{1}{\varphi}[\mathsf{G}_t - \mathsf{G}_t^* + \frac{1}{\delta}(\mathsf{G}_{t+1} - \mathsf{G}_{t+1}^*)],$$

with $\varphi \equiv 1 + \frac{\theta-1+\theta\eta}{\delta(\theta-1+\eta)}$.

For any α, unanticipated domestic money or government spending expansions generate a depreciation. However, the intuition under full-LCP is different from the standard OR95 PCP case.

Sticky prices (cont.)

ER responses to shocks with full LCP: $\uparrow \alpha$ magnifies ER response (volatility)

If PPP holds (full PCP, or $\alpha = 0$) the ER depreciates by less, the higher the elasticity of substitution θ. (Reason: $\uparrow$ER $\Rightarrow$ Expenditure switching.)

The higher the substitability effect between goods the lower the ER change required to keep the markets in equilibrium.

With LCP: high substitability plays no role in mitigating the ER response since relative changes (cross differential variables) will not change by moving the ER (no expenditure switching).

LCP leads to a more volatile ER as a result.

Note: In general, a rise in α will magnify the responde of th ER to policy shocks as long as $\theta - 1 + (\lambda - 1)\frac{\varphi}{1+1/(\delta\lambda)} > 0$. Given $\theta > 1$, a sufficient condition for this is just $\lambda \geq 1$ which is consistent with the empirical evidence.

Monetary Shock and Overshooting

Focus: Monetary shock at home relative to foreign: $\mathsf{M}_{t+1} - \mathsf{M}^*_{t+1} = \mathsf{M}_t - \mathsf{M}^*_t > 0$. This analysis abstracts from fiscal shocks (i.e., $\mathsf{G}_t = \mathsf{G}^*_t = \mathsf{G}_{t+1} = \mathsf{G}^*_{t+1} = 0$).

In $t+1$ we have equation (1):

$$\mathsf{e}_{t+1} = \mathsf{M}_t - \mathsf{M}^*_t - \frac{1}{\lambda}(\mathsf{C}_{t+1} - \mathsf{C}^*_{t+1}),$$

and from the Euler equations we obtain equation (3) stating,

$$\mathsf{C}_{t+1} - \mathsf{C}^*_{t+1} = \mathsf{C}_t - \mathsf{C}^*_t - \alpha \mathsf{e}_t.$$

Then, by replacing $\mathsf{C}_{t+1} - \mathsf{C}^*_{t+1}$ from (2),

$$\mathsf{e}_t = \frac{\varphi(\mathsf{C}_t - \mathsf{C}^*_t)}{(1-\alpha)(\theta-1) + \alpha\varphi} \tag{5}$$

which is obtained by replacing B_t from (4) and simplifying the coefficient in terms of the definition of φ.

Monetary Shock and Overshooting (cont.)

From eqs. (1), (3), (5) we have the implied future response of the ER (e_{t+1}):

$$\mathsf{e}_{t+1} = \mathsf{M}_t - \mathsf{M}_t^* - \frac{(1-\alpha)(\theta-1)}{\varphi}\mathsf{e}_t. \tag{6}$$

As long as $\alpha < 1$ the long-run ER movement is smaller than the change in money supply (the 2nd term has a negative coefficient and lowers the impact).

Reason: the shock causes a trade surplus in the short run. Then, there is a higher consumption differential in the long run ($\mathsf{C}_{t+1} - \mathsf{C}_{t+1}^* > 0$). This mitigates the ER depreciation in $t+1$ (as the t ER is higher since: $\mathsf{e}_t \propto (\mathsf{C}_{t+1} - \mathsf{C}_{t+1}^*)$).

In contrast, when $\alpha = 1$ (full LCP) $\mathsf{e}_{t+1} = \mathsf{M}_t - \mathsf{M}_t^*$.

In this case there are no changes in the consumption differential, and thus, the response of the long-run ER is the same than under flexible prices.

Implication: By removing the expenditure switching, full LCP removes the long-run monetary non-neutrality of the PCP model.

Monetary Shock and Overshooting (cont.)

Back to (6) and combining it with the money market equilibrium conditions,

$$\mathrm{e}_{t+1} - \mathrm{e}_t = -\frac{\alpha}{\varphi}\frac{\lambda - 1}{\lambda}\mathrm{e}_t.$$

Hence, absent LCP ($\alpha = 0$) there is no overshooting.

(expected since the model boils down to the OR95 setup)

With any extent of LCP ($\alpha > 0$) there will be overshooting as long as the consumption elasticity of money demand is below one ($1/\lambda < 1$).

(the same condition ensuring LCP increases ER volatility)

In the full LCP case ($\alpha = 1$), while the long-run ER is proportional to the money shock, we have that the short-run ER solution is higher:

$$\mathrm{e}_t = \frac{\lambda + 1/\delta}{1 + 1/\delta}(\mathrm{M}_t - \mathrm{M}_t^*), \tag{7}$$

which exceeds the long-run response (coefficient larger than one) as long as $\lambda > 1$ (same empirically plausible condition as before).

Response to money shocks

RER response: Consider the log linear price index equations:

$$\mathsf{P}_t = (1-n)(1-\alpha)\mathsf{e}_t, \text{ and } \mathsf{P}_t^* = -n(1-\alpha)\mathsf{e}_t.$$

Using them to obtain the real exchange rate,

$$\mathsf{e}_t + \mathsf{P}_t^* - \mathsf{P}_t = \alpha \mathsf{e}_t.$$

Then, with full PCP ($\alpha = 0$) the PPP holds, and with full LCP the RER becomes identical to the nominal ER.

(we obtained this result before in the PPP deviations lecture)

Intuitively, with full LCP, all prices in each country's CPI are fixed in the short run. Hence, the RER will move just as much as the NER.

TOT response: The short-run TOT response to money shocks is

$$\mathsf{TOT}_t = (2\alpha - 1)\mathsf{e}_t.$$

The TOT response depends on the degree of LCP. With full PCP ($\alpha = 0$) the TOT deteriorate. Since prices are set in the exporter's currency, the home currency price of imports increases, while the price of exports is unchanged.

When $\alpha = 1$ (full LCP), the TOT improve. Here prices are set in the (buyer) importer's currency. Then a depreciation raises the home currency price of exports, while the price of imports is unchanged.

Finally, when $\alpha = 1/2$ the rise in export prices just cancels out with the rise in import prices, and the there is no TOT change.

Then, a TOT improvement after a ER depreciation follows for $\alpha > 1/2$.

Disgression: The TOT and Relative Consumer Prices

Consider a representative good h and a representative foreign good f. Let $p_t(h)$ be the home currency price of h, $p_t(f)$ the home currency price of f, $q_t(h)$ the foreign currency price of h, and $q_t(f)$ the foreign currency price of f.

We can tell that under full PCP all that matters are the relative prices:

$$\frac{p_t(h)}{p_t(f)} = \frac{p_t(h)}{\varepsilon_t q_t(f)} = \frac{\varepsilon_t q_t(h)}{\varepsilon_t q_t(f)} = \frac{\varepsilon_t q_t(h)}{p_t(f)} = \frac{q_t(h)}{q_t(f)}.$$

These equalities hold due to the LOP, and show that the relative price that consumers care about and the TOT coincide (it is analogous whether TOT is defined here as $p_t(h)/(\varepsilon_t q_t(f))$ or $\varepsilon_t q_t(h)/p_t(f)$).

We have that an ER depreciation that causes the TOT to deteriorate leads consumers to relocate spending away from foreign goods.

In contrast, under full LCP, both $p_t(h)$ and $p_t(f)$ are set in advance, and the relative price that affects consumers does not move. As a consequence, the equalities above are broken.

There is no expenditure switching in consumption with LCP

Real interest rates response: Absence of PPP implies that the real interest rates will differ across countries.

The rates are defined in the model as $\mathsf{r}_{t+1} = \mathsf{d}r_{t+1}/\delta$ and $\mathsf{r}^*_{t+1} = \mathsf{d}r^*_{t+1}/\delta$. Given these,

$$\mathsf{r}_{t+1} = -\frac{1+\delta}{\delta}[(1-n)\alpha\mathsf{e}_t + \mathsf{C}^W_t], \qquad \mathsf{r}^*_{t+1} = \frac{1+\delta}{\delta}(n\alpha\mathsf{e}_t - \mathsf{C}^W_t),$$

with $\mathsf{C}^W_t = \frac{\lambda+1/\delta}{1+1/\delta}[n\mathsf{M}_t + (1-n)\mathsf{M}^*_t]$.

The Euler equations imply

$$\mathsf{C}_{t+1} - \mathsf{C}_t = \frac{\delta}{1+\delta}\mathsf{r}_{t+1}, \qquad \mathsf{C}^*_{t+1} - \mathsf{C}^*_t = \frac{\delta}{1+\delta}\mathsf{r}^*_{t+1},$$

We also had

$$\mathsf{C}_t - \mathsf{C}^*_t = \mathsf{C}_{t+1} - \mathsf{C}^*_{t+1} + \alpha\mathsf{e}_t.$$

Then, we can write

$$\mathsf{C}_{t+1} - \mathsf{C}_t - (\mathsf{C}^*_{t+1} - \mathsf{C}^*_t) = -\alpha\mathsf{e}_t = \frac{\delta}{1+\delta}(\mathsf{r}_{t+1} - \mathsf{r}_{t+1}).$$

From here we can see that, after a positive money shock that leads to a depreciation ($\uparrow \mathsf{e}_t$) we have a lower interest rate differential.

The home rate will unambiguosly fall, whereas the effect on the foreign one is ambiguous — it will not change if $\alpha = \lambda = 1$.

Consumption response: In the short run solutions for consumption are

$$\mathsf{C}_t = \mathsf{C}_t^W + (1-n)\left[\frac{(1-\alpha)(\theta-1)}{\varphi} + \alpha\right]\mathsf{e}_t,$$

$$\mathsf{C}_t^* = \mathsf{C}_t^W - n\left[\frac{(1-\alpha)(\theta-1)}{\varphi} + \alpha\right]\mathsf{e}_t,$$

Low extent of LCP: (α small) consumption rises in both countries (as in OR95).
(Intuition: with more ERPT foreign CPI $\downarrow$ and consumption $\uparrow$ via money market equilibrium)

With more LCP: Extent of ERPT is lower, and the effect of a home money shock on foreign consumption is smaller, while that on home consumption is larger.

$\Rightarrow \uparrow \alpha$ (LCP) reduces the int. transmission of money shocks to consumption.

The real interest moves to reflect this. With $\lambda = 1$ and full LCP, C_t rises, C_{t+1} is unchanged, and thus, r_{t+1} falls (see Euler equations); at the same time, r_{t+1}^* is unaffected as foreign consumption does not move.

Output response: The solution for the short-run output in each location are (linear in labor):

$$\mathsf{L}_t = \mathsf{C}_t^W + (1-n)(1-\alpha)\theta \mathsf{e}_t$$
$$\mathsf{L}_t^* = \mathsf{C}_t^W - n(1-\alpha)\theta \mathsf{e}_t$$

If α is lower, the effects of money shocks on foreign output are smaller (as there is also a depreciation).

With $\alpha = 0$ and $\lambda = 1$ we have the OR95 result: home money shock raises output, and foreign money shock lowers it ($\uparrow M_t \rightarrow \uparrow L_t$, $\uparrow M_t^* \rightarrow \downarrow L_t$).

Even if consumption transmission is positive, output transmission is negative.

Output response: (cont.)

Intuition: with expenditure switching ($\alpha = 0$) a depreciation raises home output and lowers the foreign one.

As there is more LCP ($\uparrow \alpha$) the effect of home shocks on foreign output increase. There is a lower effect in relative prices (given lower ERPT).
Output effect comes only from switch in demand from domestic consumers.

Full LCP: There is an identical increase in demand for both locations (as there is no expenditure switching) and output increases by the same amount C_t^W.
(with PCP demand increase is mitigated by changes in rel. prices).

Because there is no effects' mitigation from expenditure switching (i.e., from changes in rel. prices that allow consumers to smooth the the shock on output via cheaper consumption abroad): LCP reduces the consumption correlation and increases the output correlation.

LCP Helps to ameliorate BKK puzzle (output-consumption anomaly).

Current account response: The current account effect is

$$B_t = \frac{(1-n)(\varphi-1)(\theta-1)(1-\alpha)}{\beta\varphi}\mathsf{e}_t.$$

A domestic money shock improves the CA. But the effect is smaller with more LCP ($\uparrow \alpha$).

With full LCP: No effect.

Intuition: With full LCP (and $\lambda = 1$ or with elasticity of interest rate to consumption $1/\lambda = 1$) money and consumption increase by M_t and so agents would like to save income to smooth consumption. However a lower real interest (and lower rate differential as the foreign rate does not change) prevents them from it and induces them to consume more.

Thus, nothing induces foreign agents to borrow more. No current account effect.

Long run effect: the effect of the M shock in $\mathsf{C}_{t+1},\ \mathsf{L}_{t+1}$ decreases with α.

In OR95: $\uparrow \mathsf{M} \rightarrow \uparrow \mathsf{C},\ \downarrow \mathsf{C}^*$ by improving the NFA position.

Here: With full LCP the effect of the shock is felt only in the short run. So long-run non-neutrality is removed.

Welfare effects

As before we focus only on the real part:

$$U_t^R = \sum_{s=t}^{\infty} \beta^{s-t} \left[\log C_s + \eta \log(1 - L_s) \right],$$

with an analogous function for the foreign household.

It can be obtained:

$$\mathrm{d}U_t^R = \frac{\mathsf{C}_t^W}{\theta} + (1-n)\alpha \mathsf{e}_t, \qquad \mathrm{d}U_t^{R*} = \frac{\mathsf{C}_t^W}{\theta} - n\alpha \mathsf{e}_t.$$

(in OR95 both are C_t^W/θ and money expansions are welfare improving regardless of origin.)

Here, money helps as in OR95 but as $\uparrow\ \alpha$ (with more LCP): Home shock increases home welfare at the expense of foreign welfare

Policy can become *beggar-thy-neighbor*

Welfare effects (cont.)

Full LCP will depict *beggar-thy-neighbor* effects as long as $(1-\alpha)\left(\lambda + \frac{\theta-1}{\varphi}\right) < \left(\theta - \frac{1+1/\delta}{1+1/(\lambda\delta)}\right)\alpha$, which is plausible for $\alpha = 1$.

Intuition: Foreigners do not benefit as much from increased world output (as the policy improves home TOT, but worsens foreign TOT) and still have to work more to meet increased home demand from (higher income) home agents.

Conclusion: BD-LCP setup restores the *beggar-thy-neighbor* effects of monetary policy. It also has potential for explaining puzzles such as the consumption-output anomaly.

Quantitative Implications of LCP

Chari, Kehoe, and McGrattan (CKM, 2002, ReStud) evaluate the quantitative properties of a sticky-price model with LCP. They are interested in assessing the capacity of the framework for reproducing the observed volatility and persistence of the RER.

Stilized fact (used to test the model): volatility of RER and NER (σ_{RER}, σ_{NER}) are high; RER, NER are highly persistent while price ratio (P^*/P) across locations is less volatile.

Decompositions of data confirm Engel (1999) and Burstein et al (2005) results: Movements in RER for traded goods are the main source of RER fluctuations.
PPP deviations for traded goods $\rightarrow$ key source of PPP deviations.

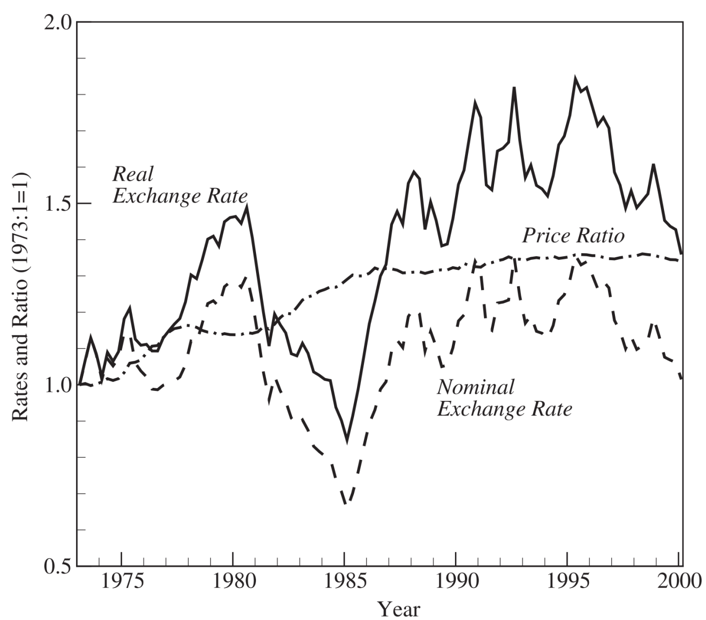

FIGURE 1
Exchange rates and the price ratio between the U.S. and Europe.

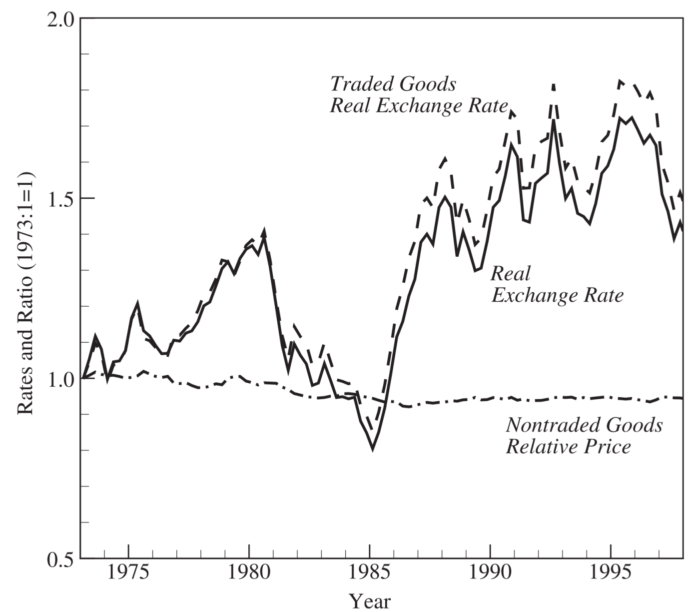

FIGURE 2
A decomposition of real exchange rates. Quarterly, 1973–98.

Source: CKM2002.

Model

- Two countries, complete international assets market, **Local Currency Pricing (LCP)**.

- Consumption: CES aggregate of home basket and foreign basket of intermediary goods (aggregation is made by competitive firms).

- The domestic and foreign intermediate goods are produced by monopolistically competitive firms (that use labor and capital).

- **The intermediary producers engage in LCP**.

- Staggered prices as in Taylor (1980): N period stickyness by firm.

Each period $1/N$ firms set prices at home $P_H(z, s^{t-1})$ and abroad $P_H^*(z, s^{t-1})$ prices are fixed until all firms change. Thus $P_H(z, s^{t+\tau-1}) = P_H(z, s^{t-1})$ for $\tau = 0, 1, \cdots, N-1$ (and the same with P_H^*); z is the firm index.

- Same condition as in BS1993: $Q(s^t) = \kappa \frac{U_c^*(s^t)}{U_c(s^t)}$

- Monetary policy: assumed persistent and to follow a stochastic process $M^s \sim AR(1)$

Results:

The model can account for the RER volatility with reasonable parameters (e.g., $N = 4$, risk aversion of 5, etc.). However, the model cannot account for the persistence of the RER. (CKM call this the *Persistence anomaly*).

The model also yields the BS1993 puzzle: It generates a condition that leads to a high correlation between the RER and relative consumption. There is no such pattern in the data. *consumption-real exchange rate anomaly*.

Proposed modifications: Incomplete markets, habit persistence, wage sticky-ness, Taylor Rule. These still do not solve the issues.

Conclusion: Sticky price models are subject to a robust Consumption-RER anomaly (BS puzzle).

- On the other hand, Imbs, Mumtaz, Ravn, and Rey (QJE, 2005) argue that the CKM model does not give the sticky price model a fair change to match the persistence of the RER.

The key insight is that, given sectoral heterogeneity, to match the persistence of the RER, a model with multiple sectors should be used. Or analogously, if we use a one-sector model without heterogeneity, we should be trying to match the persistence obtained with techniques that purge the effect of heterogeneity. If this is done, the CKM can capture the persistence.

- On the consumption-RER anomaly, important contributions have also been made by Benigno and Thoenissen (2008), and Corsetti, Dedola, and Leduc (2008).