Slides for International Finance

Purchasing Power Parity

Alan G. Isaac
American University

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Preview

- Purchasing power parity
  - Commodity price parity
  - Absolute PPP vs. Relative PPP
- Classical model of price determination
  - LR neutrality of money
  - Fisher effect
  - magnification effect
- Monetary approach to flexible exchange rates
  - Exchange rates in the long run
- Real exchange rate determination
  - PPP shortcomings
  - nominal vs. real shocks

Law of One Price

Law of One Price (LOP): identical goods have identical prices.
ensured by arbitrage (given low transactions costs)

Commodity Price Parity (CPP): the international LOP.

$$P_i = EP_i^*$$

Economic Laws

Economic “laws” are just points of reference:

- not like physical laws
- violations *expected*
- violations stimulate investigation

Commodity Price Parity (CPP)

Example:

- Two fast-food restaurants: one in New York, and one across the border in Montréal.
- assume markets are competitive and that transportation costs and barriers between markets are not important.

$$P^{US}_{burger} = (0.95 USD/CAD) \quad \times \quad P^{CA}_{burger}$$

Here P^{US}_{burger} = price of burger in New York, P^{CA}_{burger} = price of burger in Montréal, and 0.95 USD/CAD is the CAD-USD exchange rate.
CPP applies the law of one price: the price of the same burger (using a common currency to measure the price) in the two cities must be the same.

CPP Example

On 02 March 2021:

- 1oz of gold sold in New York for about USD 1736
- 1 oz also sold in London for GBP 1241.36
- One GBP sold in both locations for about USD 1.4

Gold satisfies CPP: $1736 \approx 1.4 * 1241.36$

Source: various.

Exchange Rate Models: SR vs. LR

Models predict how exchange rates behave.

SR model: A “Keynesian" story about the money market:

money $\rightarrow$ interest rates $\rightarrow$ exchange rate

LR model: A “Classical" story about the money market:

1. money $\rightarrow$ price level $\rightarrow$ exchange rate
2. money growth $\rightarrow$ inflation $\rightarrow$ depreciation

“Long-Run” Models

Meaning of LR is *always* model specific

Here: the model is the simplest “Classical” model

- all prices adjust; all markets in equilibrium
  - “all” = goods, services, factors of production

Purpose of LR models:

- predict future tendencies
- anchor LR expectations
- do *not* describe SR exchange rate behavior

Real Exchange Rate

The real exchange rate (q):

- rate of exchange of goods and services across countries.
- *relative* price of goods and services across countries.
- price of foreign goods and services in terms of domestic goods and services:

$$q = EP^* / P$$

EP^* = domestic currency price of foreign goods
P = domestic currency price of domestic goods

Units of the Real Exchange Rate

$$
\begin{aligned}
q_{\frac{US}{EU}} &= (\#USD/EUR)\frac{\#EUR/\text{basket}_{\text{EU}}}{\#USD/\text{basket}_{\text{US}}} \\
&= \frac{\#\text{basket}_{\text{US}}}{\text{basket}_{\text{EU}}}
\end{aligned}
$$

Real Exchange Rate Depreciation (↑q)

$$q = EP^*/P$$

real depreciation:

- a rise in q
- foreign commodities cost more in terms of domestic commodities

Example: a real depreciation of the USD

- US products buy fewer foreign products
- our ability to trade off US goods for EU goods declines

Real Exchange Rate Appreciation ($\downarrow q$)

$$q = EP^*/P$$

real appreciation: a fall in q

foreign commodities cost less in terms of domestic commodities

Example: a real appreciation of the USD

- US products buy more foreign products
- our ability to trade off US goods for EU goods improves

Purchasing Power Parity (PPP)

Core PPP idea:

- real exchange rate (q) is constant
- exchange rate movements match relative price movements

Absolute Purchasing Power Parity

- the application of the law of one price across countries for "baskets" of goods and services.
- average price levels determine the exchange rate.
- the domestic currency has the same purchasing power in all countries.

$$P = EP^* \qquad \Longrightarrow \qquad q = 1$$

P = level of domestic prices (e.g., US)
P^* = level of foreign prices (e.g., CA)
E = exchange rate (e.g., CAD-USD 0.95)

Absolute Purchasing Power Parity (Absolute PPP)

Absolute purchasing power parity:

$$E = P/P^*$$

Example:

- P = USD 300 per basket
- P* = EUR 200 per basket
- absolute PPP
  $E = P/P^*$ = USD 300/EUR 200 = 1.5 USD/EUR
  (the EUR-USD exchange rate is 1.5)
- 1.5 USD buys the same amount of goods as 1 EUR
  therefore 1.5 USD buys 1 EUR

Two Forms of PPP

Relative PPP: $E = qP/P^*$ with q relatively constant

Exchange rates are proportional to the level of relative average prices across countries

Absolute PPP: $E = P/P^*$

Exchange rates equal the level of relative average prices across countries; $q = 1$

Both: exchange rate changes (depreciation) match changes in prices (inflation) between two periods:

$$\frac{E_t - E_{t-1}}{E_{t-1}} = \pi_t - \pi_t^*$$

where π_t = inflation rate from period t-1 to t.

PPP: An Implication

Recall

$$q = EP^* / P$$

Apply growth-rate algebra to transform this to:

$$\widehat{q} = \widehat{E} + \widehat{P^*} - \widehat{P}$$

Now suppose that the real exchange rate (q) is constant (i.e., $\widehat{q} = 0$).

$$0 = \widehat{E} + \widehat{P^*} - \widehat{P}$$
$$\widehat{E} = \widehat{P} - \widehat{P^*}$$

Conditions for absolute PPP:

The conditions for *absolute* PPP are extremely demanding.

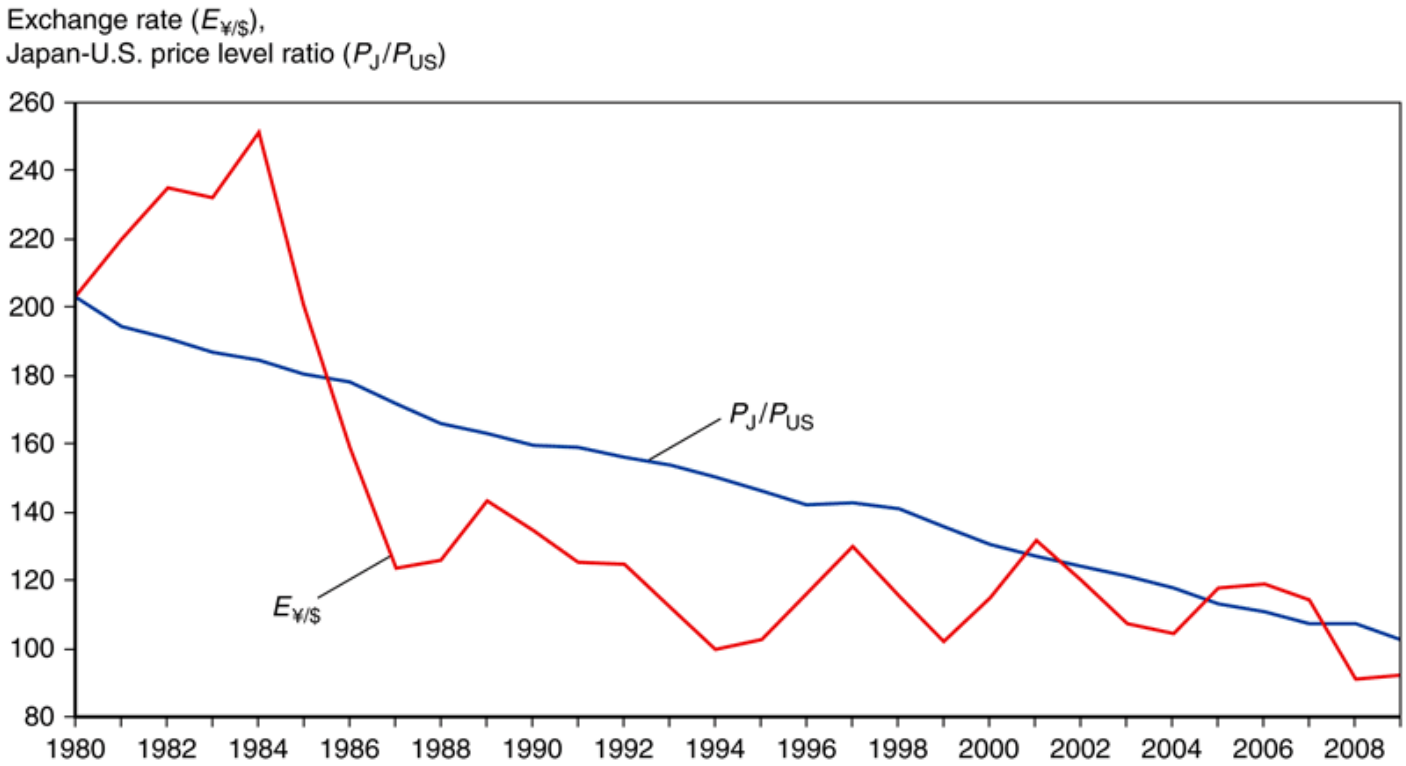
- CPP for every commodity
- identical index-basket construction

Absolute PPP is essentially the LOP for price indices.
Price indexes do not meet the conditions for absolute PPP.
So absolute PPP is largely for classroom convenience; relative PPP has more real-world relevance.

Shortcomings of PPP

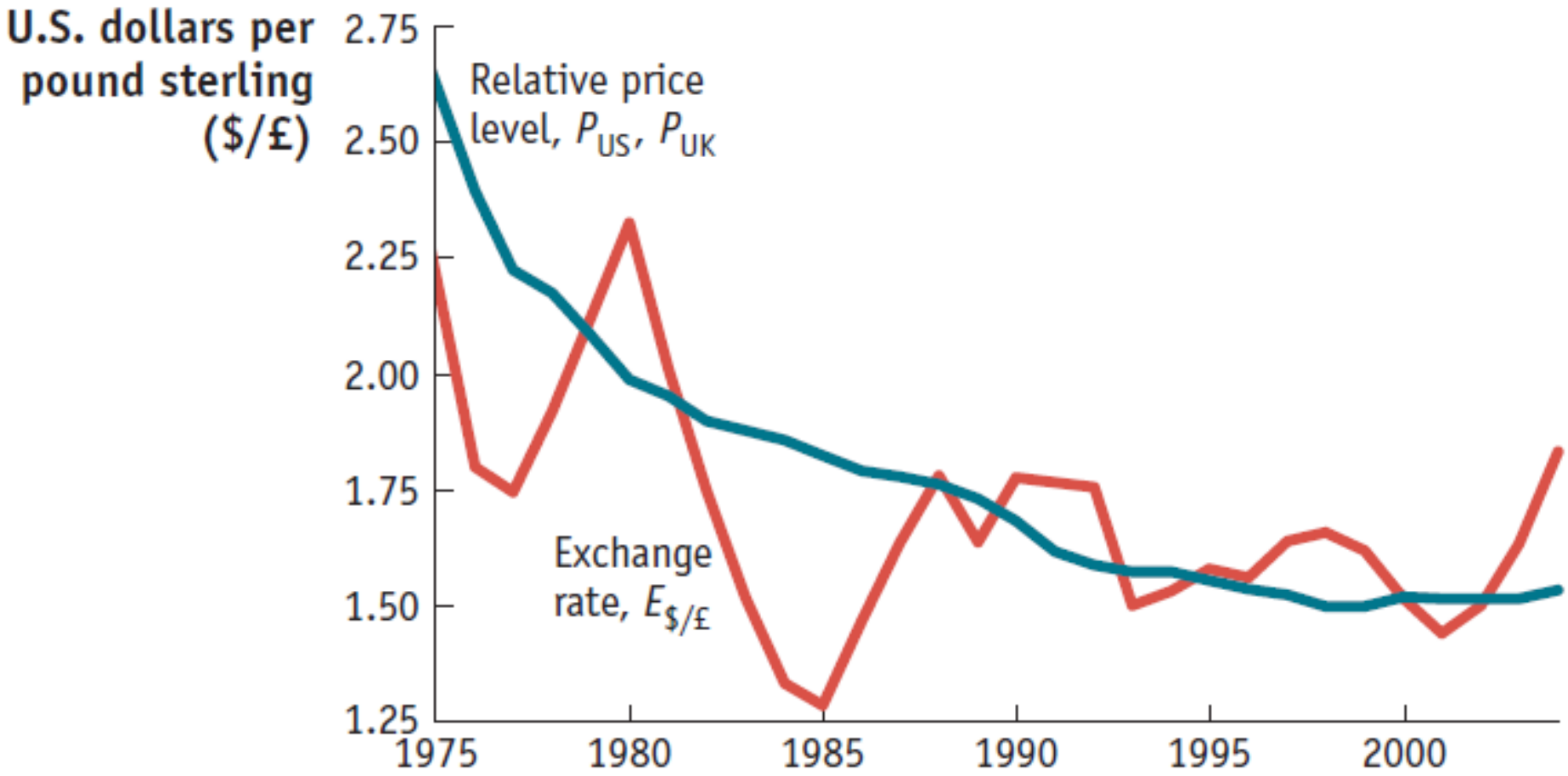
- Little empirical support for absolute PPP.
  - The prices of identical commodity baskets, when converted to a single currency, differ substantially across countries.
- Relative PPP is more consistent with data, but it also poorly predicts exchange rates in the short run.

The Yen/Dollar Exchange Rate and Relative Japan-U.S. Price Levels, 1980–2009



Source: KOMIF Fig 5-2 (KOMIE 16-2) Data Source: IMF, International Financial Statistics. End-of-year data.

GBP-USD Exchange Rate and Relative Price Levels



Source: `http://www.worthpublishers.com/html/staticcontent/nonstandard/include/0716792834/MacroCH14.pdf`

Deviations from PPP

PPP may not hold due to

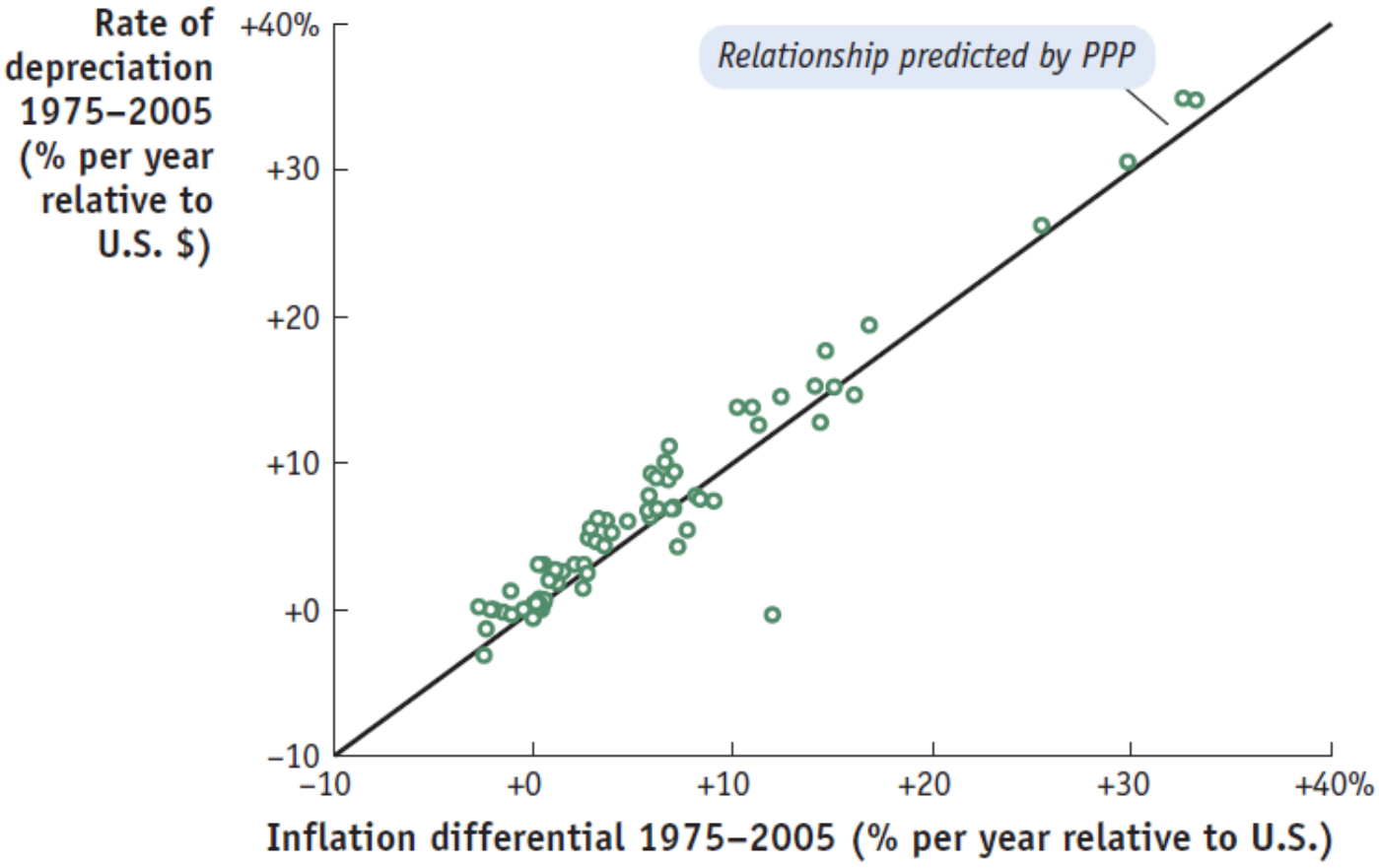
- violations of the law of one price
  - Trade barriers
  - non-tradable products
  - Imperfect competition
- divergent price index construction (different baskets of goods and services)

Deviations from PPP: Barriers to Trade

Barriers to frictionless trade are the most fundamental source of PPP deviations:
Trade barriers and non-tradable products $\rightarrow$ one price need not hold in two markets.

- Transport costs
- governmental trade restrictions
- non-tradeable goods
  - some services are not readily tradable (classic example, haircuts).
- The greater the barriers to trade, the greater the possible deviation from PPP.

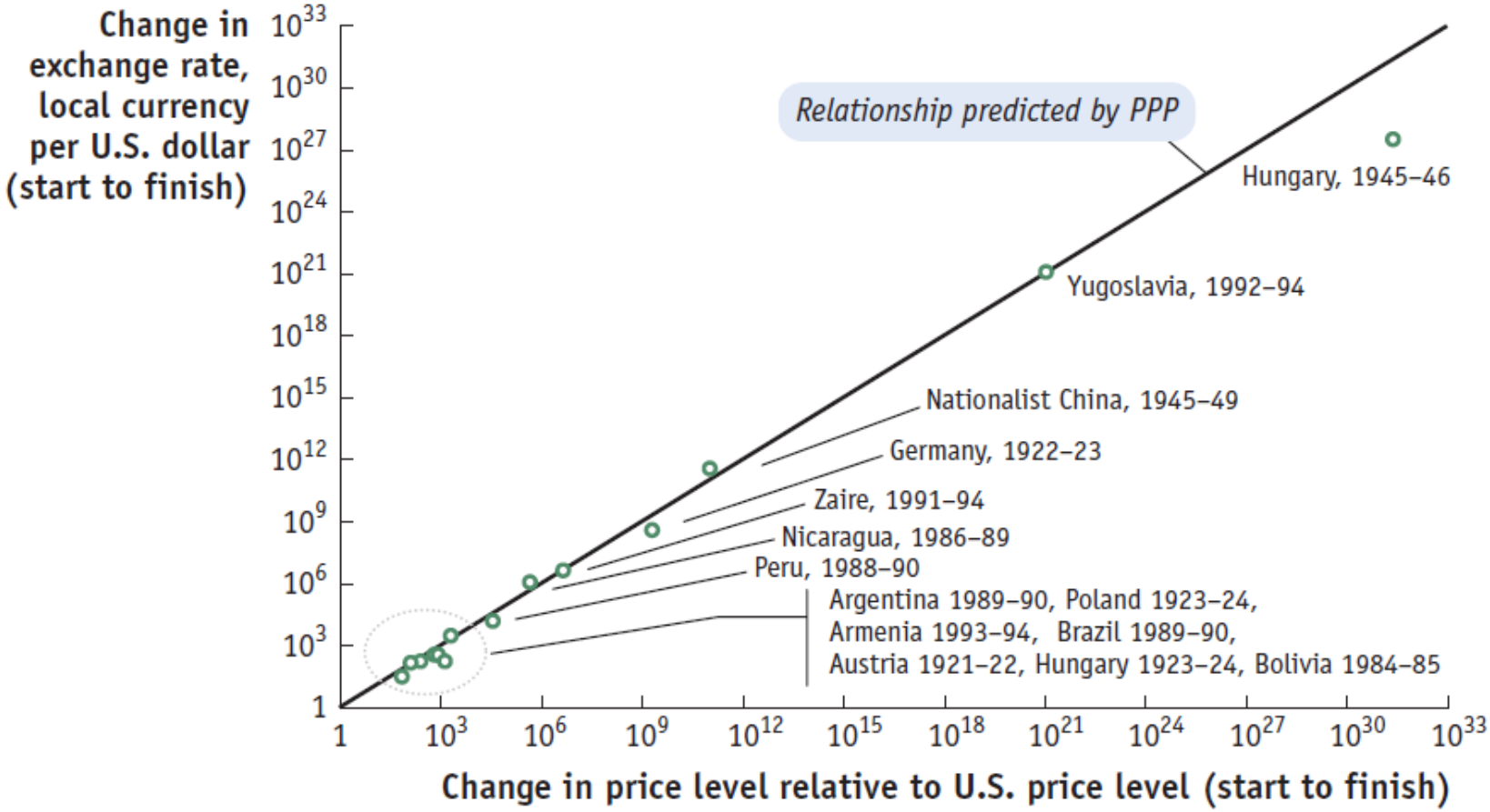
Depreciation and Inflation Differentials (82 Countries)



Source: Feenstra and Taylor chapter 14

Supportive of relative PPP!

Some 20th Century Hyperinflations



Source: `http://www.worthpublishers.com/html/staticcontent/nonstandard/include/0716792834/MacroCH14.pdf`

Data Source: Cagan (1956); Petrovic and Mladenovic (2000 JMCB)

Monetary Approach to Flexible Exchange Rates (MAFER)

Flexprice MAFER Assumptions:

- relative PPP (or absolute PPP, in the classroom)
- Classical model of price-level determination

The monetary approach uses monetary factors to predict how exchange rates adjust in the **long run**.

Classical Model of Price-Level Determination

Money market in equilibrium:

$$\frac{M}{P} = L[R, Y]$$

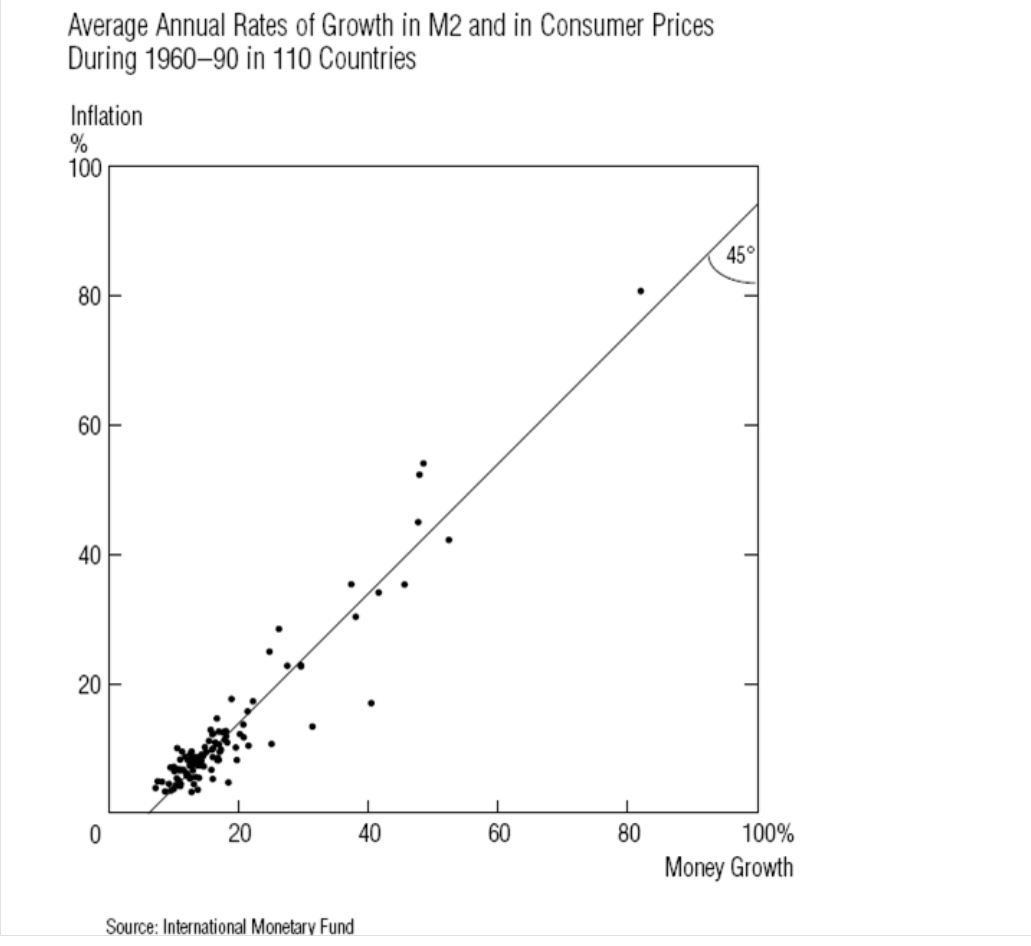
Flexible prices to clear money market, so that the real money supply (M/P) equals real money demand (L).

$$P = \frac{M}{L[R, Y]}$$

Classical Model of Inflation Determination

Key implication: inflation driven by money growth.

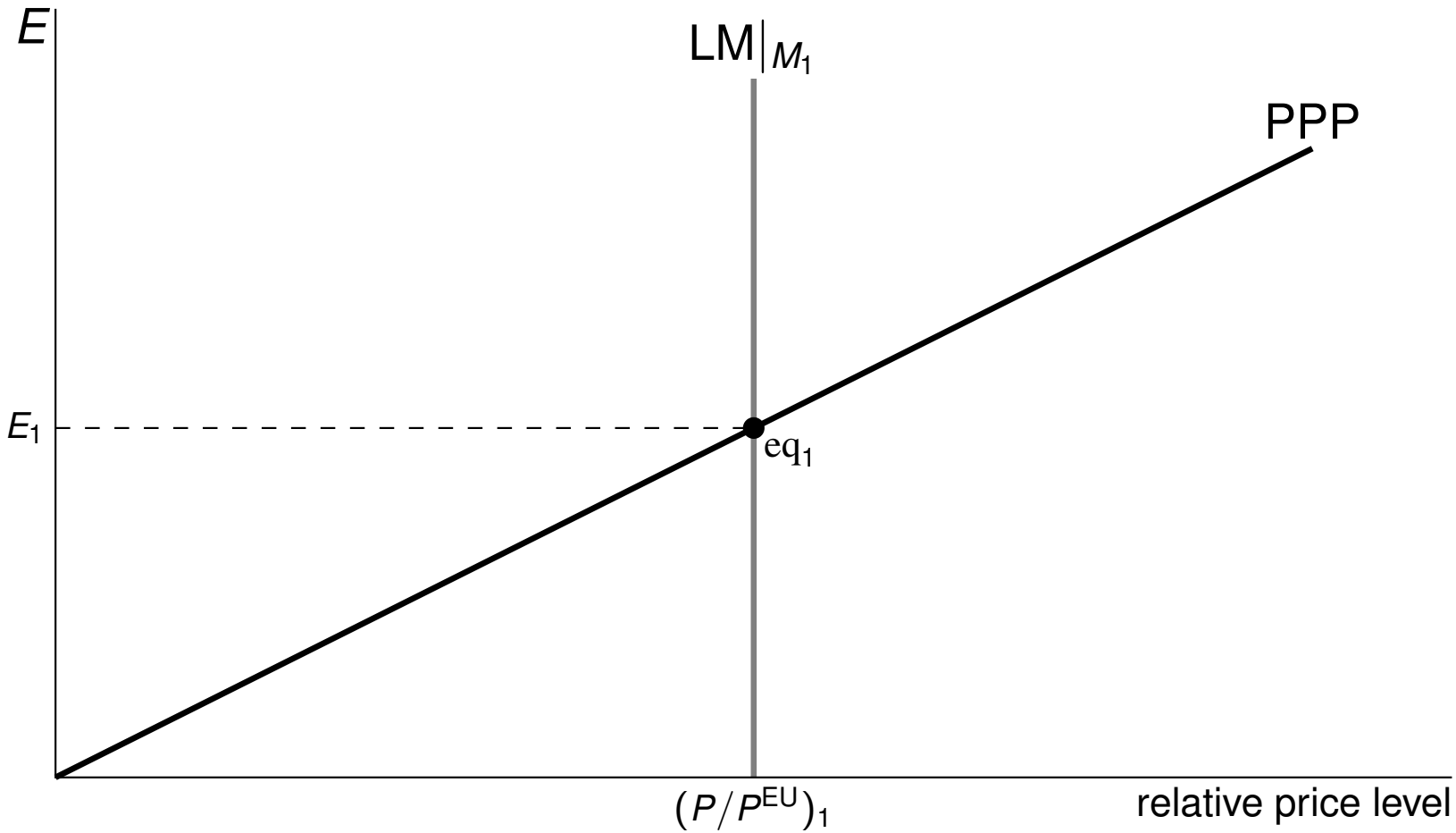
$$\widehat{P} = \widehat{M} - \widehat{L}$$



Classical Model of Relative Price-Level Determination

$$P = M/L[R, Y]$$
$$P^* = M^*/L^*[R^*, Y^*]$$
$$\frac{P}{P^*} = \frac{M/M^*}{L/L^*}$$

Equilibrium in a Classical Model



MAFER Predictions

positive money supply (level) shock:

- $\uparrow$P and $\uparrow$E proportionally
- R does not change

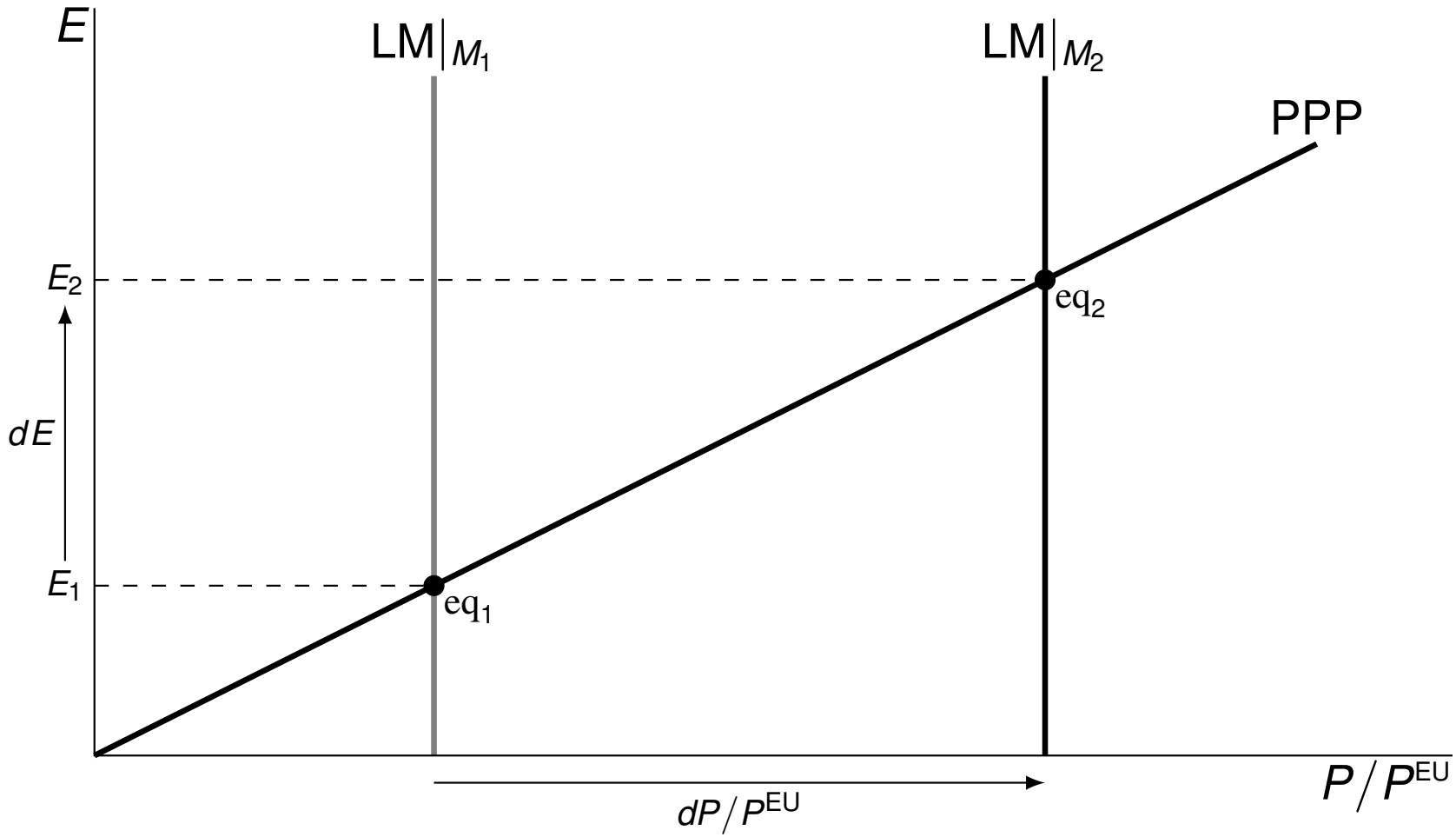
positive output shock:

- $\downarrow$P and $\downarrow$E roughly proportionally
- R does not change

We need to explore these predictions.

Modifications of the model will modify these predictions.

Money Shock in a Classical Model



M Shock: Compare and Contrast

SR model:

- "sticky" prices
- $\uparrow$M $\rightarrow$ $\uparrow$M/P
- $\uparrow$M $\rightarrow$ exchange rate overshooting
  SR movement > LR movement

MAFER:

- "flexible" prices
- $\uparrow$M $\rightarrow$ $\uparrow$P proportionally: M/P unchanged
- $\uparrow$M $\rightarrow$ $\uparrow$E proportionally: **no overshooting**
- neutrality of money
  no real changes

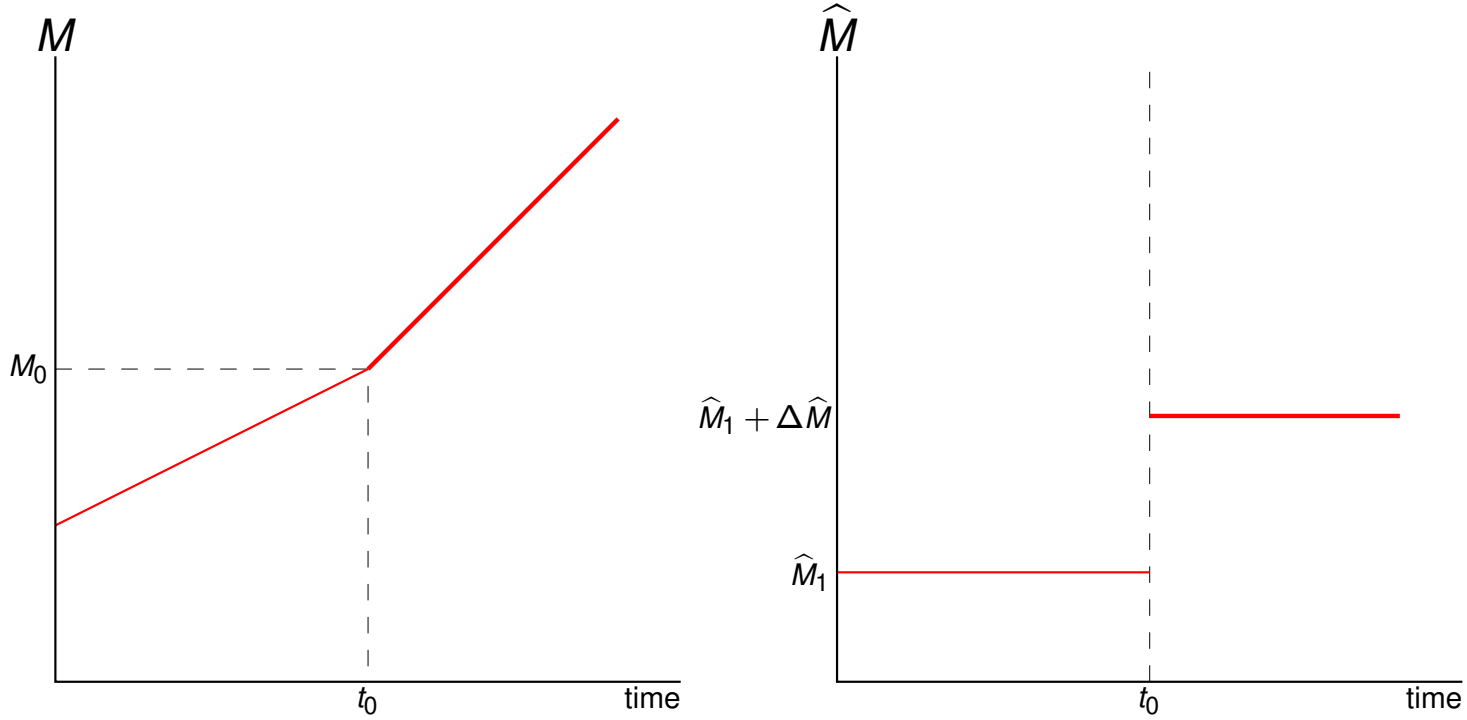
MAFER may seem to impose neutrality of money even in the SR, so that SR movement = LR movement.
But it is just a LR model (aside from hyperinflations),

New Experiment: Change in Growth of M

New Experiment!!

- Suppose that the U.S. central bank unexpectedly increases the growth rate of the money supply at time t0 by 5% per year.

Permanent Increase in Domestic Money Growth



Compare KOMIE 16-1 (KOMIF Fig 5-1)

Note: M is measured on a ratio scale.

Classical Model Prediction

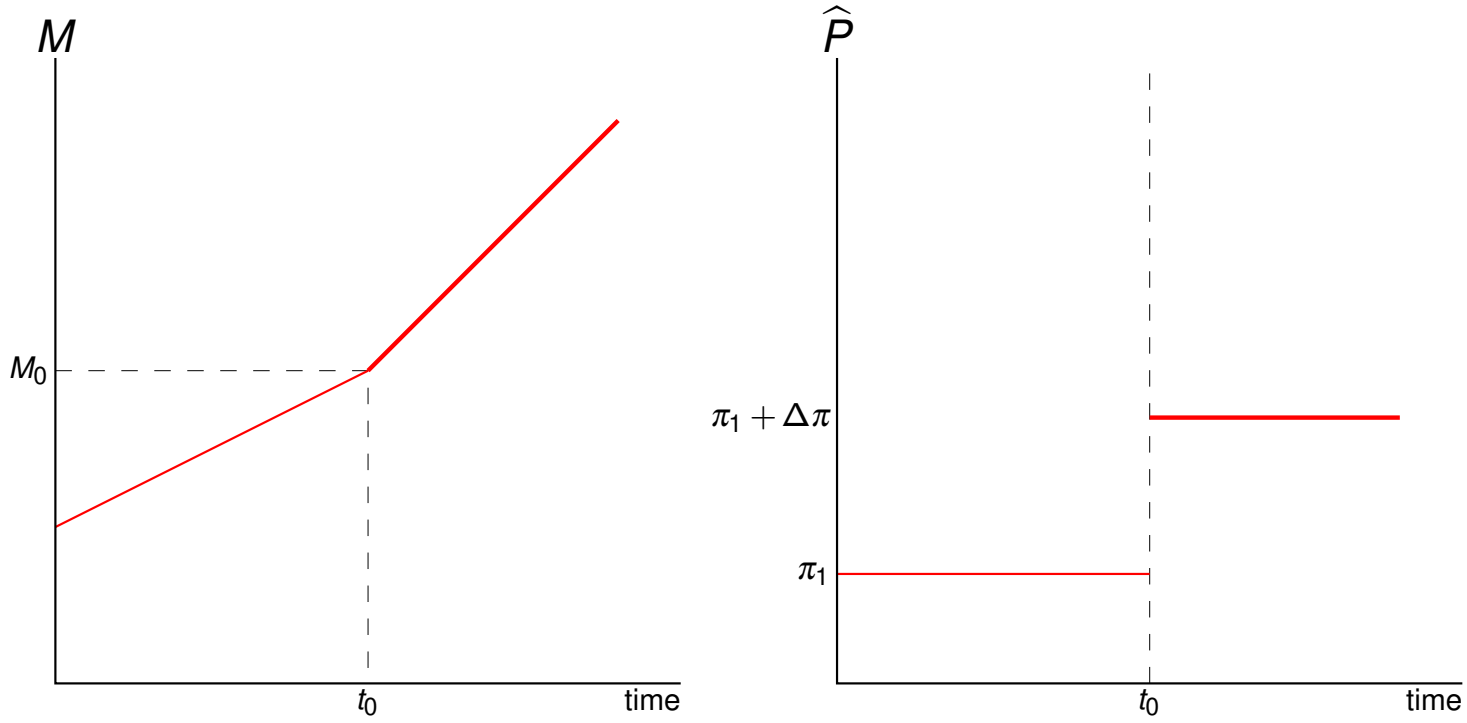
- The inflation rate rises by 5% per year

$$\pi_{new} = \pi_{old} + \Delta\pi = \pi_{old} + 5\%$$

Note

$\pi \equiv \widehat{P}$

Permanent ↑M Growth → ↑P Growth



Compare KOMIE 16-1 (KOMIF Fig 5-1)

Note

M is measured on a ratio scale.

$\pi \equiv \widehat{P}$

MAFER Prediction

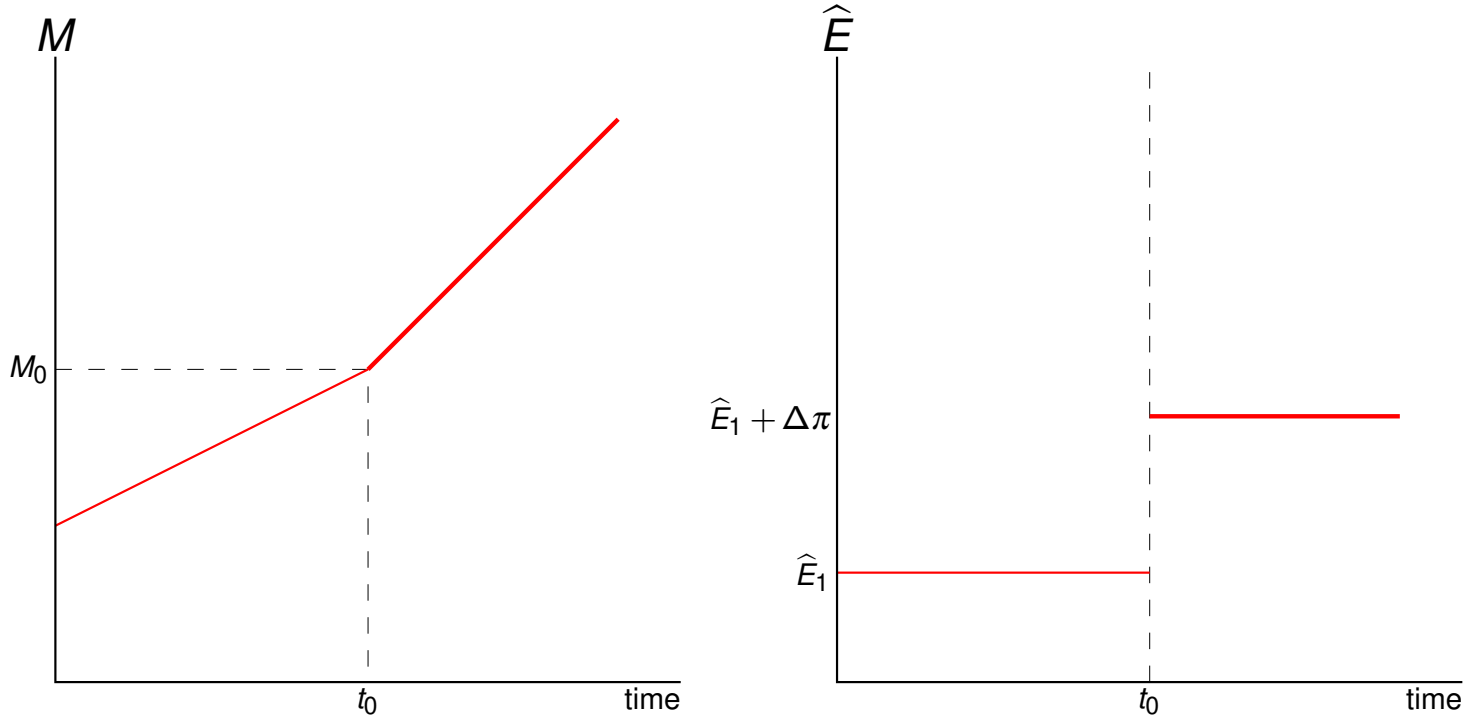
Exchange-rate rate rises by 5% per year

$$\begin{aligned}\widehat{E}_{\text{new}} &= \widehat{E}_{\text{old}} + \Delta\widehat{E} \\ &= \widehat{E}_{\text{old}} + \Delta\pi \\ &= \widehat{E}_{\text{old}} + 5\%\end{aligned}$$

Note

Classical model implies $\Delta\pi = \Delta\widehat{M}$.
PPP implies $\Delta\widehat{E} = \Delta\pi$.

Permanent ↑M Growth → ↑E Growth



Note

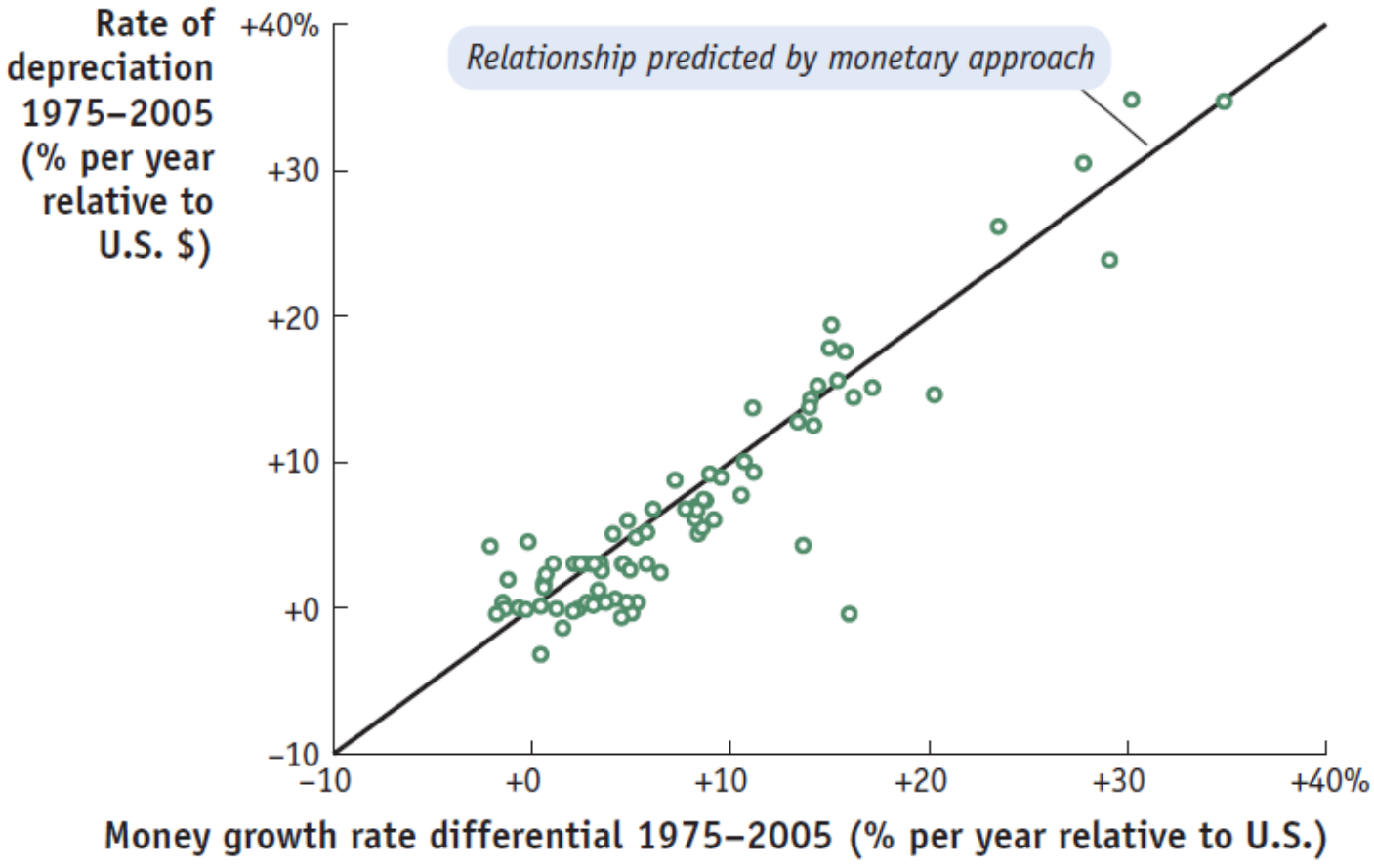
M is measured on a ratio scale.

$\pi \equiv \widehat{P}$

PPP implies $\Delta\widehat{E} = \Delta\pi$.

Compare KOMIF Fig 5-1 (KOMIE 16-1)}

Money Growth and Depreciation (82 Countries)



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Data Source: IFS

New Consideration: Fisher Effect

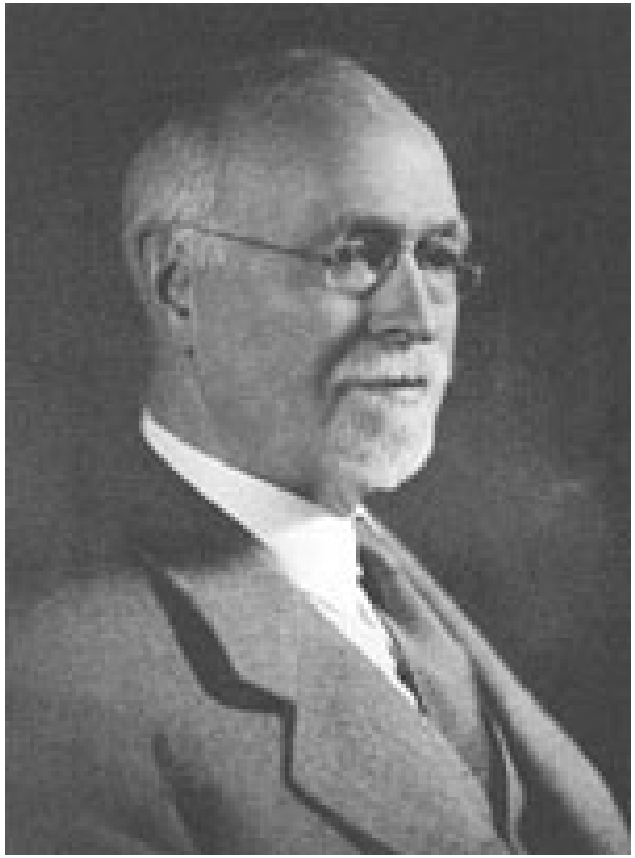
Fisher Effect:

$$\uparrow \pi^e \rightarrow \uparrow R$$

Fisher effect example: if expected inflation rises by 5%, the interest rate will also rise 5%.

Implication: a sustained rise in inflation ($\uparrow \pi$) eventually causes an equal increase in the nominal interest rate ($\uparrow R$).

Irving Fisher (1867–1947)



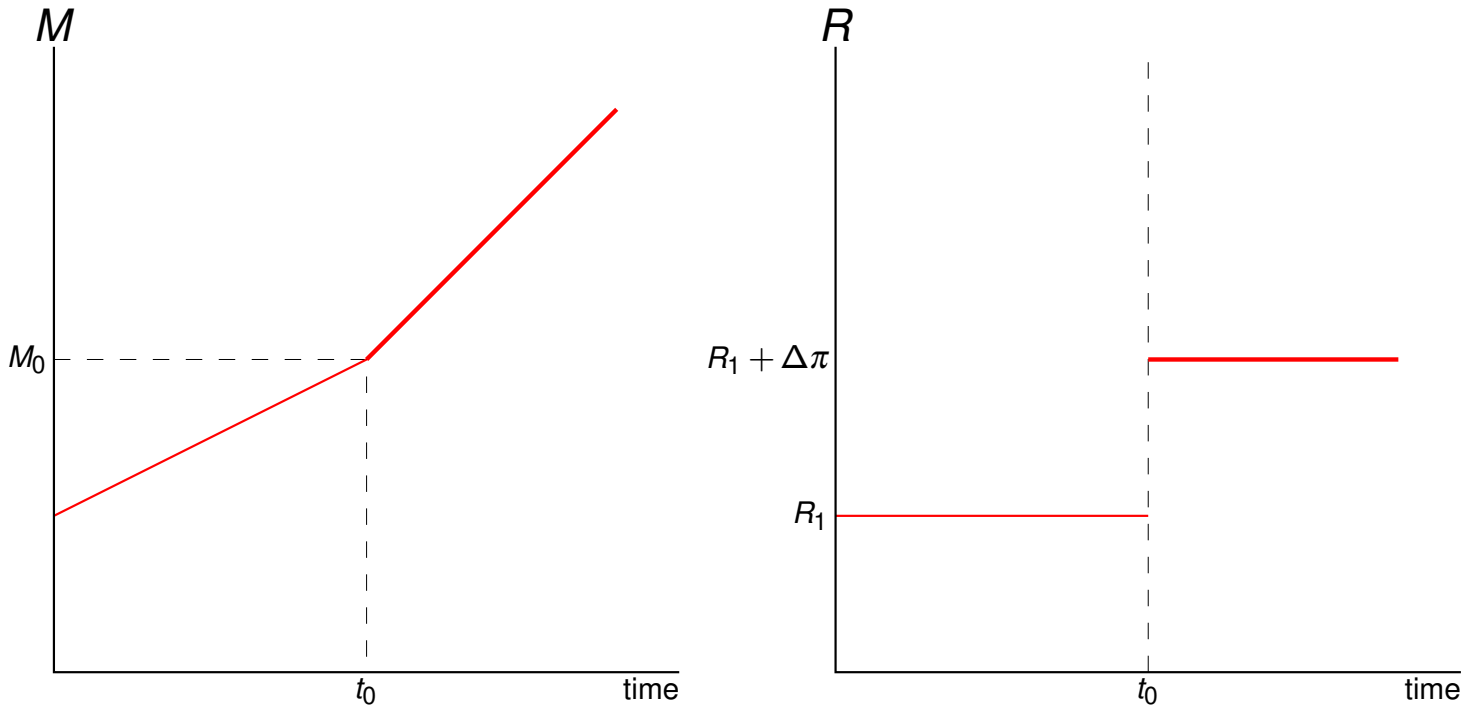
1888 BA from Yale

1891 First Yale PhD in Econ

17 Oct 1929 Most famous prediction: “Stock prices have reached what looks like a permanently high plateau.” (Oct 28–29 were called “Black Monday” and “Black Tuesday” as NYSE share prices collapsed.)

1930 *The Theory of Interest*

Permanent ↑M Growth → ↑R



Notes:

M is measured on a ratio scale.

Compare KOMIE 16-1 (KOMIF Fig 5-1)

MAFER Predictions

positive money growth rate shock:

- inflation and depreciation increase in step ($\widehat{P}$ and $\widehat{E}$)
- expected inflation mathches inflation ($\widehat{P}^e = \widehat{P}$)
- $\uparrow$R (in step with inflation; the Fisher effect)

Sustained higher money growth $\rightarrow$

- sustained higher inflation ($\widehat{P}$, or π)
- sustained higher depreciation ($\widehat{E}$, or $(E_{t+1} - E_t)/E_t$)

Fisher effect:

- $R = R_{\text{real}} + \pi^e$

A New Effect on the Money Market

We now link expected inflation directly to money growth:

- $\uparrow \widehat{M} \rightarrow \uparrow \pi^e$ (expectations formation)
- $\uparrow \pi^e \rightarrow \uparrow$ R (Fisher effect)
- $\uparrow$R $\rightarrow \downarrow$L
- $\downarrow$L $\rightarrow \uparrow$P

The increase in nominal interest rates decreases the demand for real monetary assets. For the money market to be in equilibrium at the new R, the price level must rise so that money market equilibrium is maintained.

$$\underset{\uparrow}{P} = \frac{M}{L[\underset{\uparrow}{R}, Y]}$$

MAFER and Increased Money Growth

- $\uparrow \widehat{M} \rightarrow \uparrow \pi^e$
- $\uparrow \pi^e \rightarrow \uparrow$ R
- $\uparrow$R $\rightarrow \downarrow$L
- $\downarrow$L $\rightarrow \uparrow$P $\rightarrow \downarrow$M/P
- $\uparrow$P$\rightarrow\uparrow$E (by PPP)

The exchange rate must rise (the dollar must depreciate) proportionately in order to maintain PPP:

$$E = q\frac{P}{P^*}$$

Thereafter, M and P rise faster by $\Delta\pi$, as does E (the direct rate).

- In order to maintain PPP, the domestic currency continues to depreciate proportionately.

Real Interest Rates

Real interest rate: inflation-adjusted interest rate
measured in terms of real output

- savers can buy more goods and services when their assets pay real interest
- borrowers can buy fewer goods and services when they must pay real interest on their borrowing

Ex ante real interest rate: expected real interest rate

$$r^e = R - \pi^e$$

Here $\pi^e =$ expected inflation rate and R= nominal interest rate.

Changes and Expected Changes

$$q = EP^*/P \implies \widehat{q} = \widehat{E} + \widehat{P^*} - \widehat{P}$$
$$\implies \widehat{q}^e = \widehat{E}^e + \widehat{P^*}^e - \widehat{P}^e$$

Write π^e and π^{*e} for $\widehat{P}^e$ and $\widehat{P^*}^e$.
Write $(E^e - E)/E$ for $\widehat{E}^e$ and $(q^e - q)/q$ for $\widehat{q}^e$.

$$q = E\frac{P^*}{P} \qquad \implies \frac{q^e - q}{q} = \frac{E^e - E}{E} + \pi^{*e} - \pi^e$$

Real Interest Rate Differentials

Anticipated Real Depreciation:

$$\frac{q^e - q}{q} = \frac{E^e - E}{E} + \pi^{*e} - \pi^e$$

UIP:

$$R - R^* = \frac{E^e - E}{E}$$

Together: Anticipated changes in q show up as a real interest differential.

$$\begin{aligned}\frac{q^e - q}{q} &= (R - R^*) + \pi^{*e} - \pi^e \\ &= (R - \pi^e) - (R^* - \pi^{*e})\end{aligned}$$

PPP plus UIP imply Real Interest Parity:

Real Interest Parity

Real interest rate differentials (across countries) must equal expected changes in the real exchange rate.

$$(R - \pi^e) - (R^* - \pi^{*e}) = (q^e - q)/q$$
$$r^e - r^{*e} = (q^e - q)/q$$

RIP says that the real interest rate differential between countries equals to the expected change in the relative price of goods and services between countries.

Expected PPP

If financial markets expect (absolute or relative) PPP to hold, then expected exchange rate changes will equal expected inflation between countries:

$$q = EP^*/P \implies \frac{q^e - q}{q} = \frac{E^e - E}{E} + \pi^{*e} - \pi^e$$

$$(q^e - q)/q = 0 \implies 0 = \frac{E^e - E}{E} + \pi^{*e} - \pi^e$$

$$\implies \frac{E^e - E}{E} = \pi^e - \pi^{*e}$$

Expected PPP and Real Interest Parity

If financial markets expect (absolute or relative) PPP to hold, then expected exchange rate changes will equal expected inflation between countries:

real interest parity: $(R - \pi^e) - (R^* - \pi^{*e}) = (q^e - q)/q$

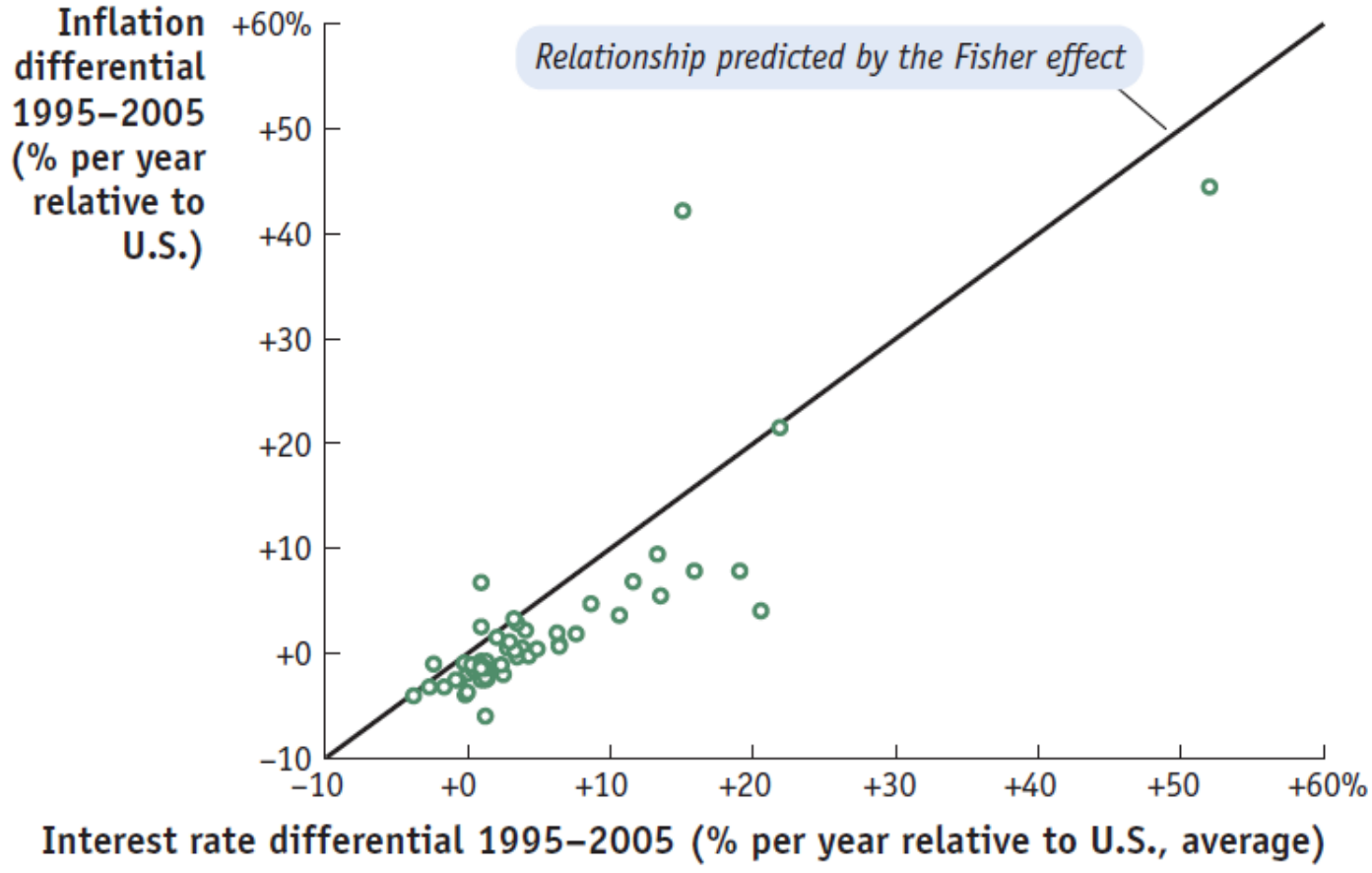
expected PPP: $(q^e - q)/q = 0$

real interest rate equality: $R - \pi^e = R^* - \pi^{*e}$

We also get an international version of the Fisher effect.

$$R - R^* = \pi^e - \pi^{*e}$$

Interest Differentials and Inflation Differential (62 Countries)



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Data Source: IFS

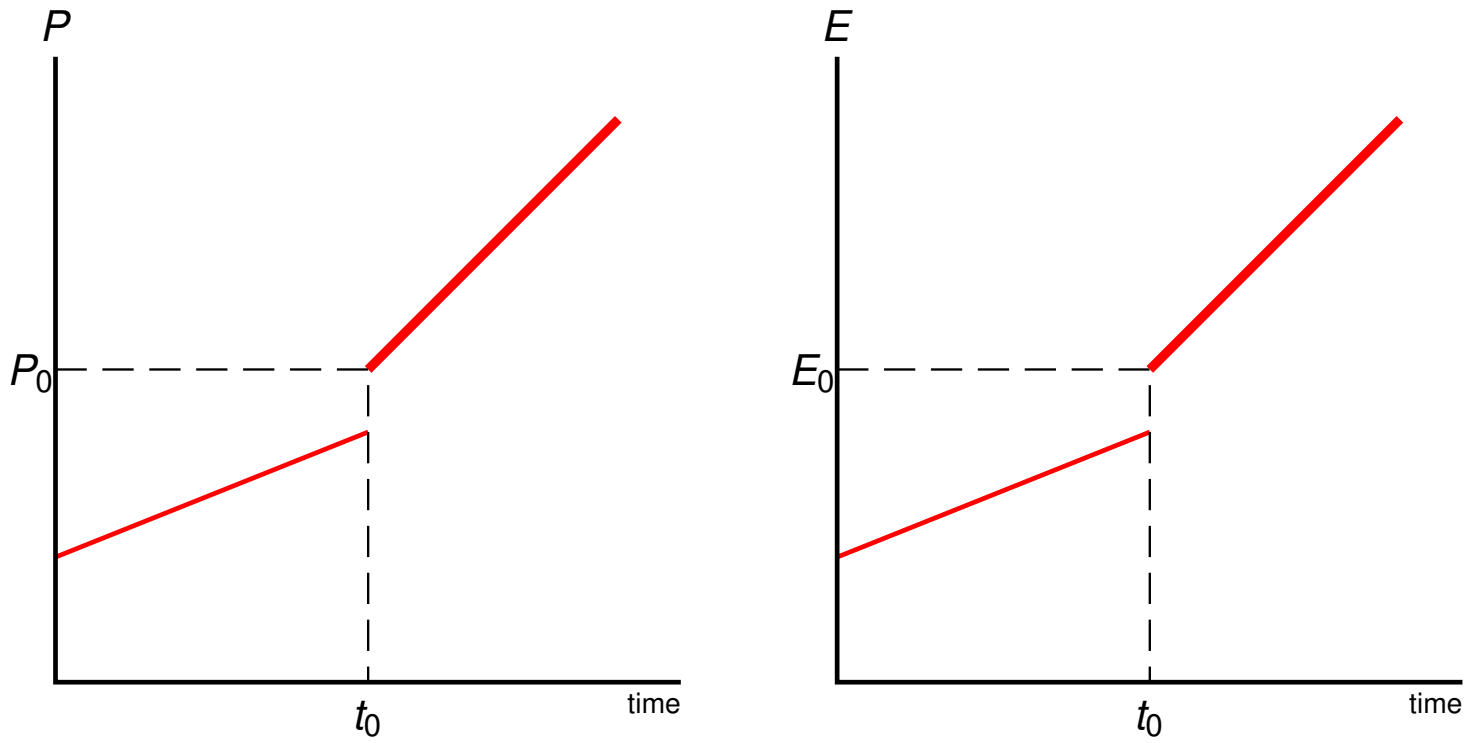
New Prediction: Magnification Effect

Magnification effect:

- $\uparrow \pi \rightarrow \uparrow \pi^e \rightarrow \uparrow R$
- $\uparrow$R $\rightarrow \downarrow$L $\rightarrow \downarrow$M/P
- P must move **more** than M

Bottom line: P jumps and E jumps when policy changes.
The jump is the **magnification effect**, a response to $\uparrow$R

Permanent Increase in Domestic Money Growth



Note

P and *E* are measured on a ratio scale.

PPP implies *E* is proportional to *P*

Compare KOMIE 16-1 (KOMIF Fig 5-1)}

Permanent ↑M Growth (MAFER)

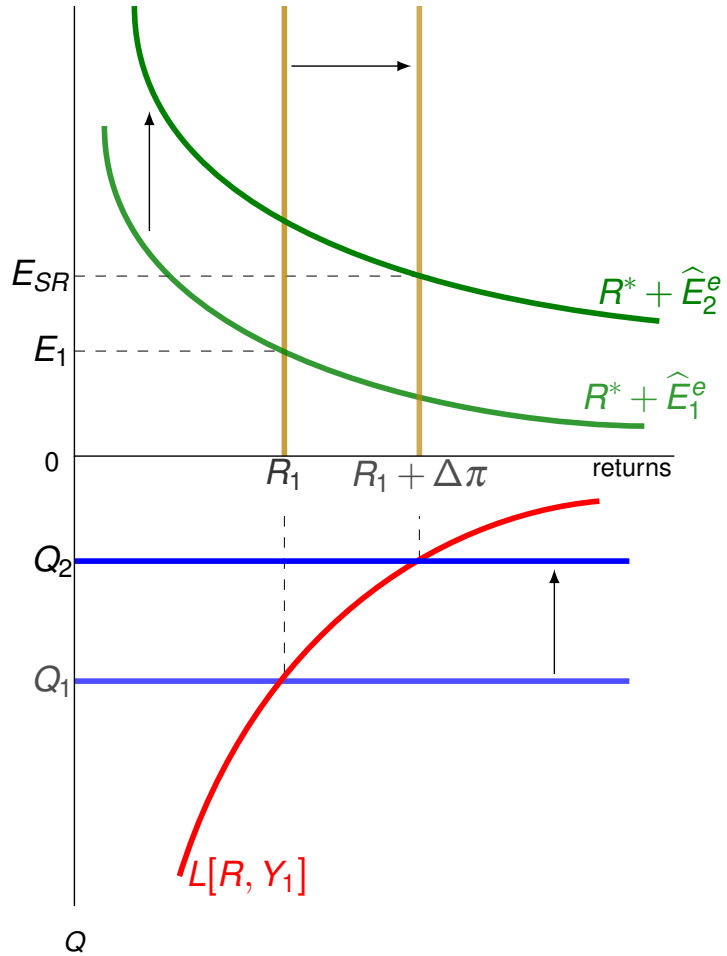
- Permanent ↑M growth causes permanent ↑P growth
- the domestic currency must depreciate when domestic inflation exceeds foreign inflation (by PPP)

Furthermore:

- $\uparrow \pi \rightarrow \uparrow \pi^e \rightarrow \uparrow R \rightarrow \downarrow L \rightarrow \uparrow P, E$
- Persistent domestic inflation increases expected inflation.
- Higher expected inflation causes a rise in the domestic nominal interest rate (by the Fisher effect).
- Higher R reduces desired real balances.
- Therefore, there is a magnification effect on P and E.

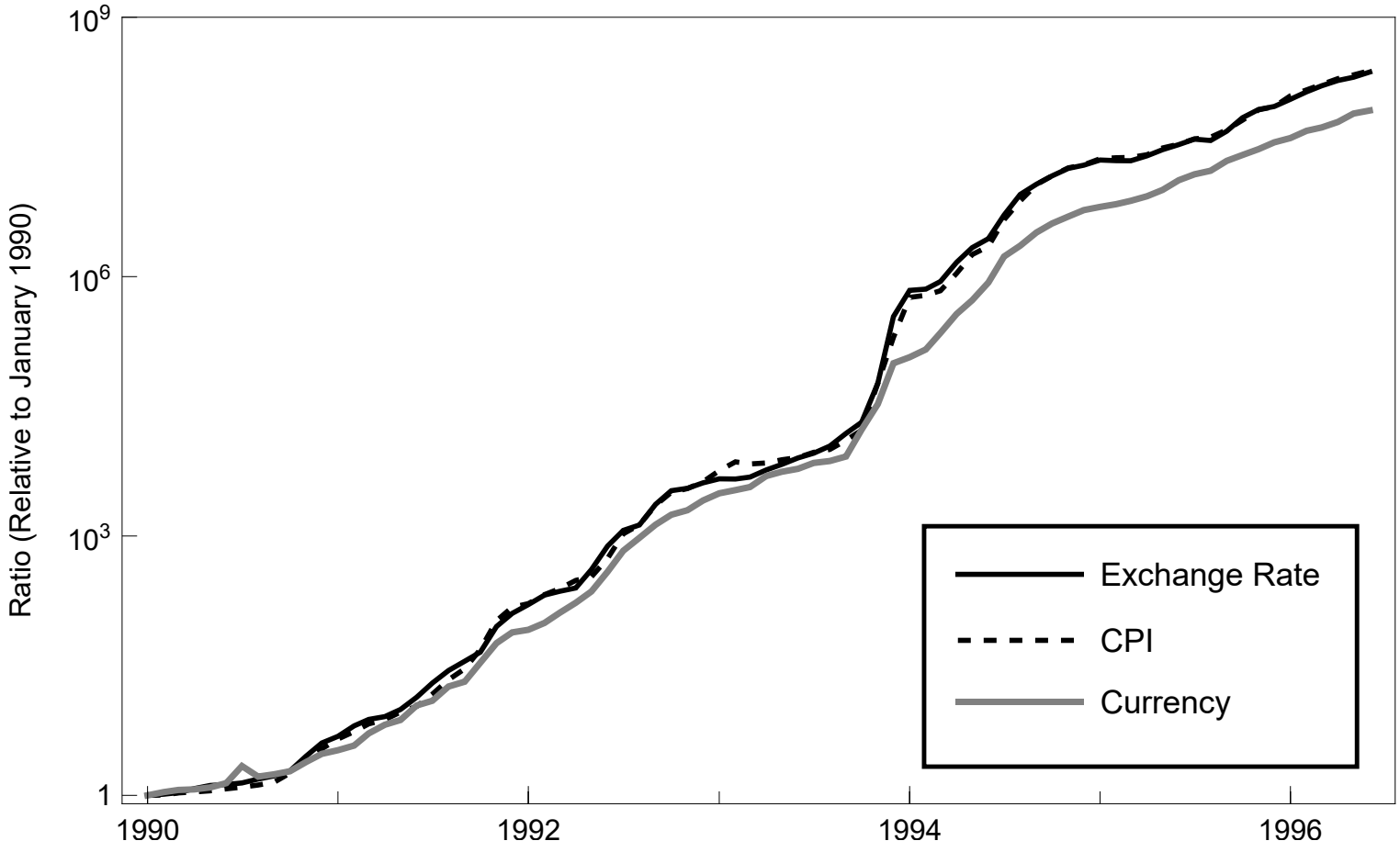
MAFER Redux: An Assets-Markets Visualization

↑M Growth: Initial (t0) Effect (flexp MAFER)



Note: Compare KOMIE Fig 16A (KOMIF Figure 5A-1)

Inflation in Zaire



Computing Big Mac PPP

Get the Following Data:

- E: current exchange rate (direct rate; domestic terms)
- P: local price
- P*: US price

Computation:

1. Eppp = P/P*
2. overvaluation = $\frac{E_{ppp}}{E} - 1$

Equivalent Computation:

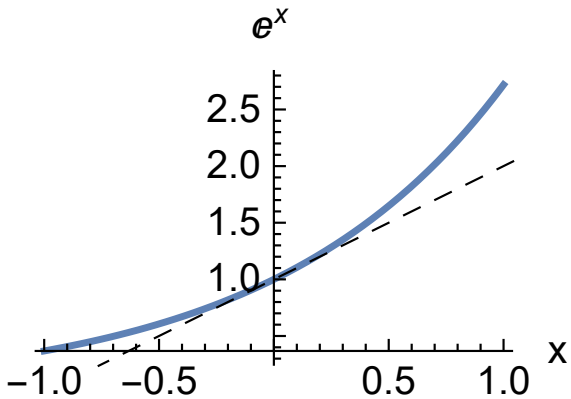
1. $q = EP^* / P$
2. overvaluation = $\frac{1}{q} - 1$

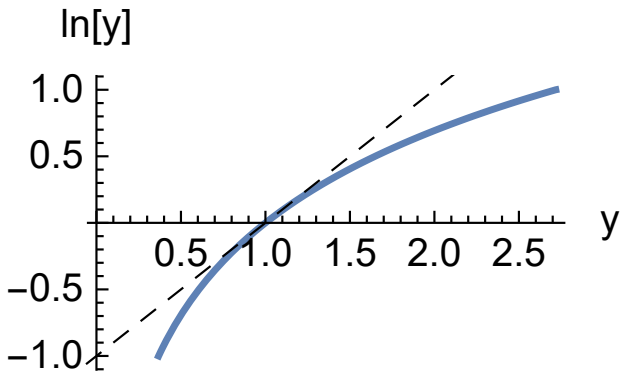
Approximate Computation

1. $q = EP^*/P$
2. overvaluation = $1/q - 1$
3. overvaluation $\approx -\ln[q]$

Explanation:

Since $\ln[1+x] \approx x$, you can get a rough approximation of overvaluation as $-\ln(q)$. (This works best when q is near 1.)





Switzerland (CHF) 2022 Example:

`https://www.economist.com/big-mac-index`

Treating US as foreign country!

- P = CHF 7.10
- P^* = USD 5.69
- Compute: Eppp = P/P* = 7.10/5.69 = 1.25 CHF/USD
- Actual E: USD-CHF 0.87
- overvaluation = (Eppp/E -1) = $\left(1.25/0.87 - 1\right) \approx 0.435$

Switzerland (CHF) Alternative Computations

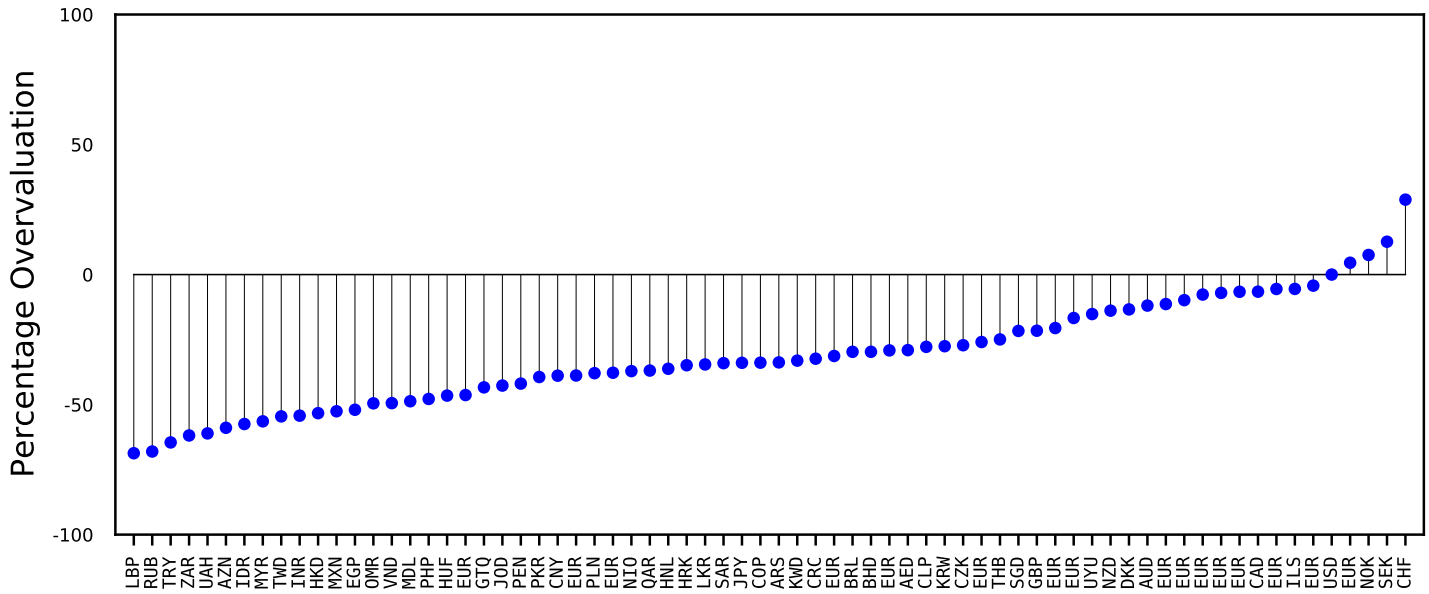
Using real exchange rate:

- q = EP*/P = 0.87 * 5.69 / 7.10 = 0.7
- overvaluation = 1/q - 1 = 1/0.7 - 1 = 43.5%

Logarithmic approximation

- overvaluation = -ln(q) = -ln(0.7) = 35.7%

Law of One Price for Hamburgers? (2021)



Data Source:

`https://github.com/TheEconomist/big-mac-data`

Additional information:

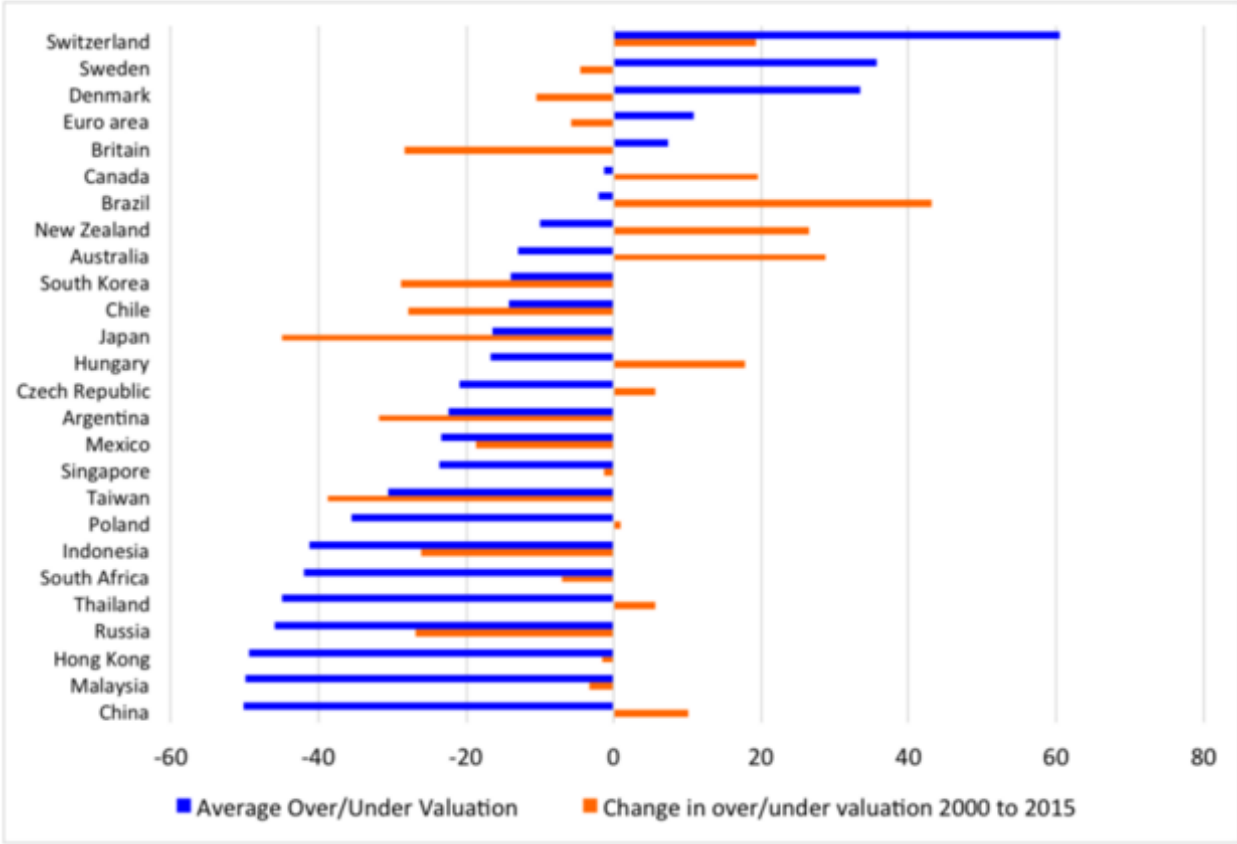
`https://www.economist.com/big-mac-index`

China (CNY) 2022 Example:

Interactive chart from The Economist:
`https://www.economist.com/big-mac-index`
Note the autocorrelation in deviations.

Big Mac vs PPP: Persistent Deviations

Big Mac Index: Percent of under- and over-valuation of currencies relative to the U.S. dollar, 2000–2015



Source: `http://www.moneyandbanking.com/commentary/2015/2/2/a-big-mac-update`

Data Source: The Economist

Penn Effect

Naive GDP comparison: relative GDP = E GDP* / GDP

Penn effect: naive comparisons systematically exaggerate real per capita income ratios between poor and rich

Empirics Penn studies of Kravis-Heston-Summers real-income estimates, using actual local prices and incomes

Theory Balassa (1964) and Samuelson (1964)
Also: David Ricardo and Roy Harrod

Paul Samuelson (1915-2009)

1941 PhD from Harvard

1947 *Foundations of Economic Analysis*

1948 *Economics: An Introductory Analysis*

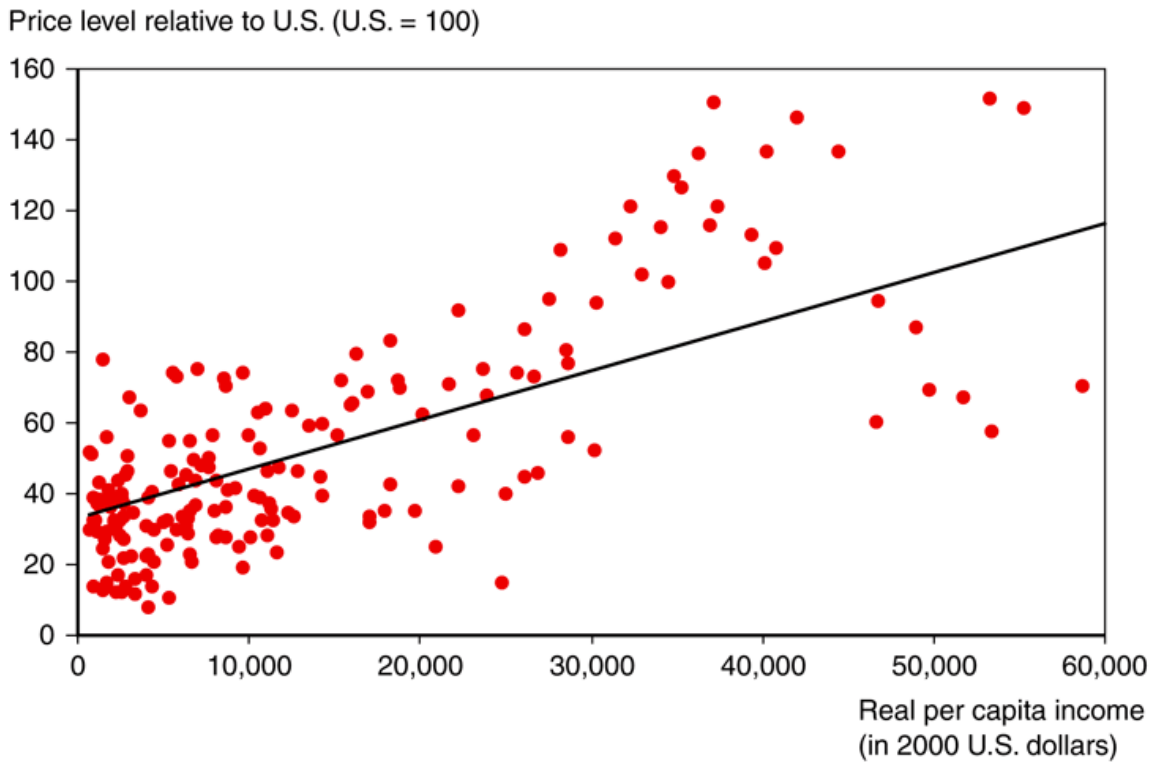
1970 "Nobel" prize

1973 famous prediction (in his textbook): the Soviet Union will catch up to the United States in per capita income by 1990

Balassa-Samuelson Critique

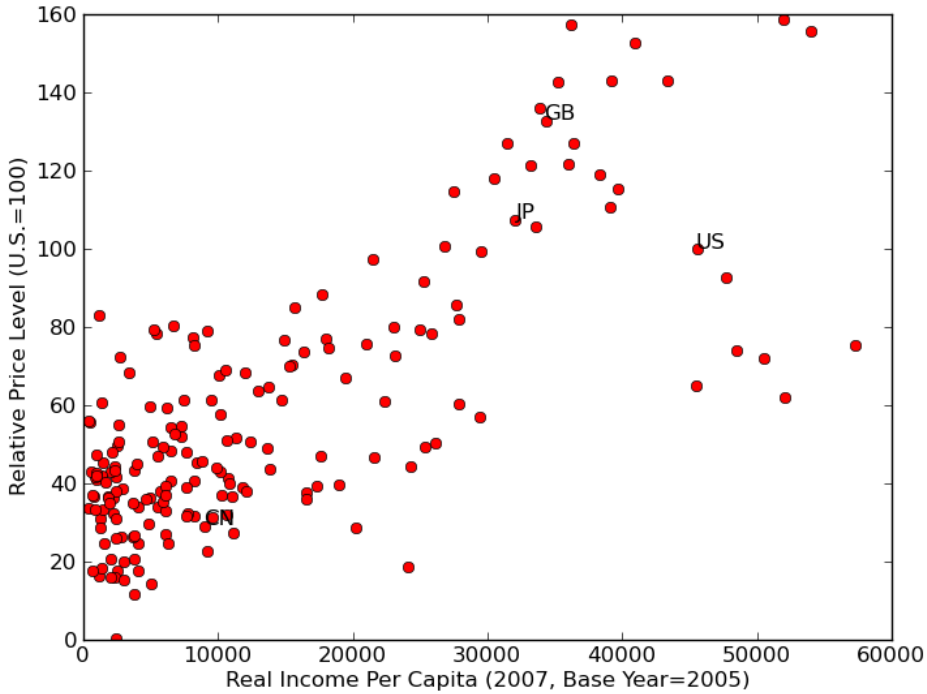
- Price indices contain traded and nontraded goods
  - $P = f[P_t, P_{nt}]$
- Shifts in relative price can disrupt PPP
  - Ricardo (1817): high manufacturing productivity $\rightarrow$ costly nontraded goods
  - Samuelson (1964)
- disparate postwar growth rates
- income growth correlated with traded goods productivity
  - Dollar should look overvalued against low growth countries
- even if $P_t = EP_t^*$

Price Levels and Real Incomes, 2004

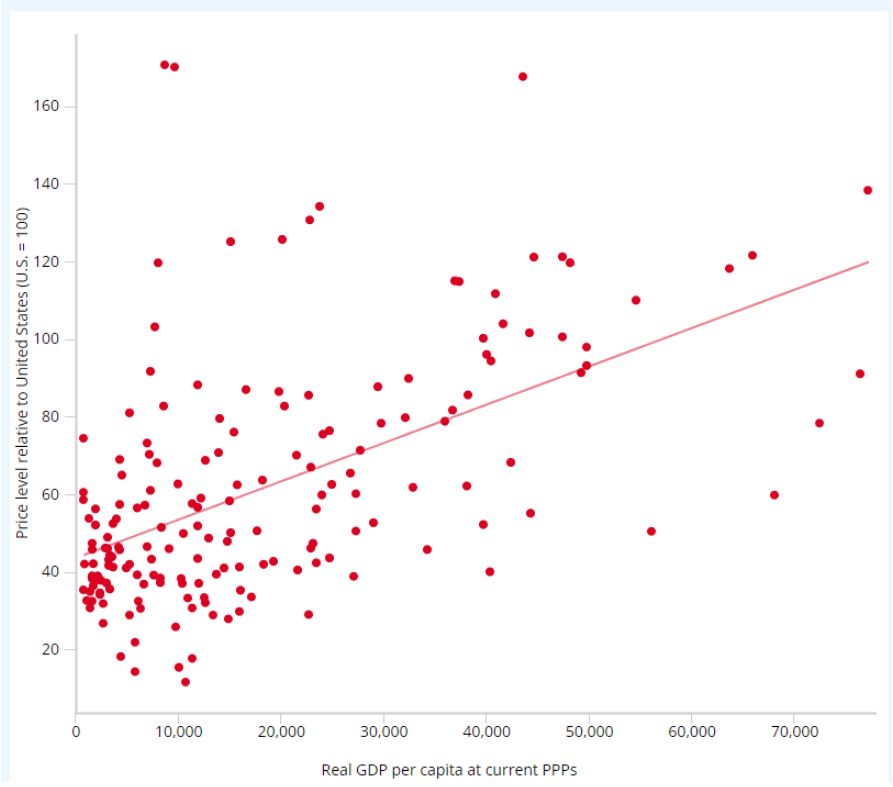


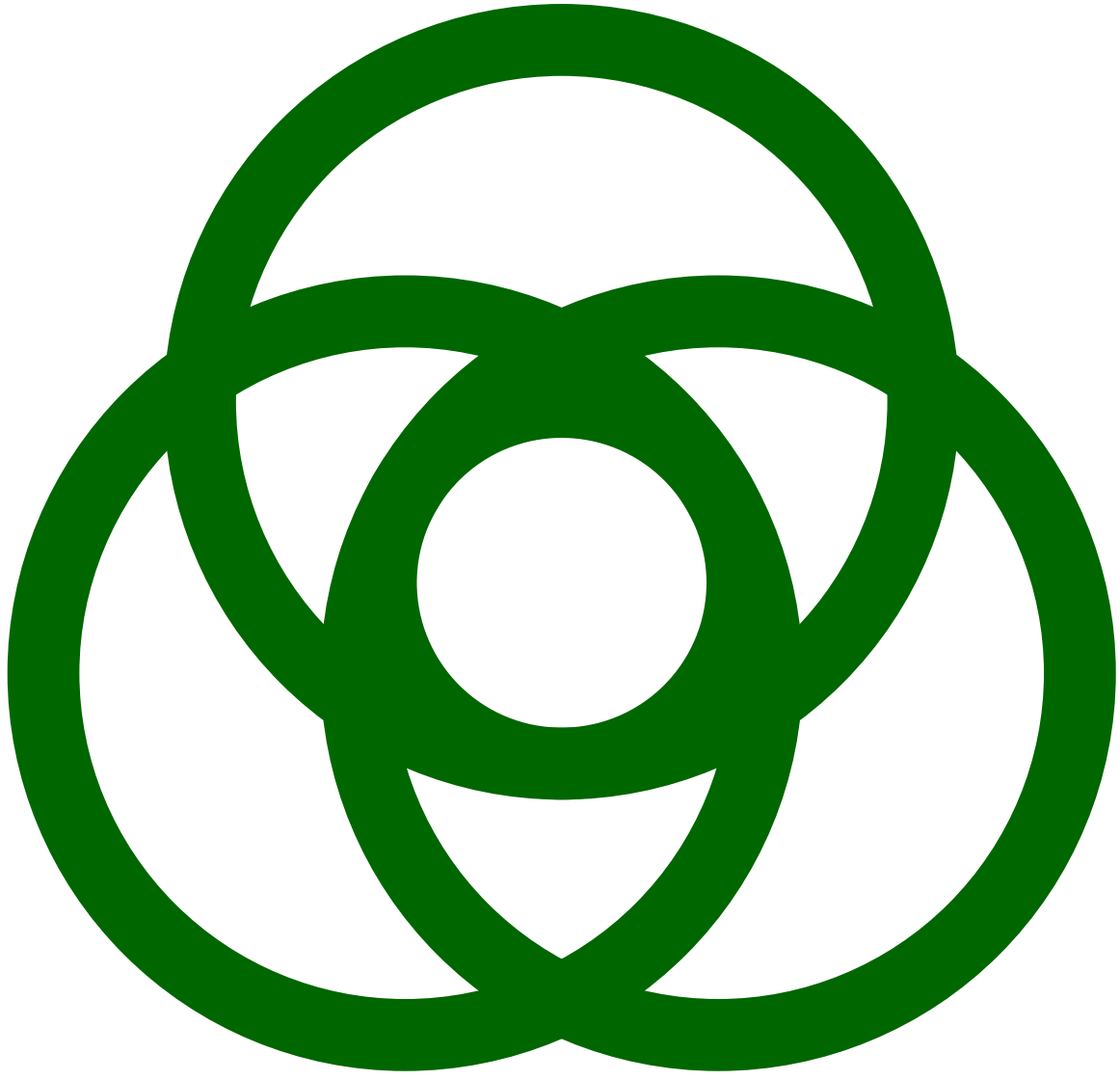
Source: KOM Figure 16-3 (Data Source: Penn World Table, Mark 6.2)

Price Levels and Real Incomes, 2007



Price Levels and Real Incomes, 2017





Endogenous LR Real Exchange Rate

PPP (absolute or relative): a constant real exchange rate

$\rightarrow E = qP/P^*$ (with q constant)

$\rightarrow \Delta$ relative price level determines ΔE

$$\%\Delta E = \%\Delta(P/P^*)$$

A more general story tries to explain changes in the real exchange rate.

Beyond PPP (absolute or relative): endogenous LR real exchange rate

$$\%\Delta E = \%\Delta q + \%\Delta(P/P^*)$$

$$\widehat{E} = \widehat{q} + \widehat{(P/P^*)}$$

Now movements in nominal exchange rate then have two sources:

- changes in relative price levels
- changes in LR real exchange rate

Determination of the Long-Run Real Exchange Rate

LR output (Y and Y^*) depends on:

- factors of production
- technology.

LR demand (AD and AD*) depends on:

- the **relative** price of foreign products ($q = EP^*/P$)
- Relative prices determine the demand for domestic products **relative** to foreign products.
- when the real exchange rate depreciates, the relative demand for domestic commodities rises.

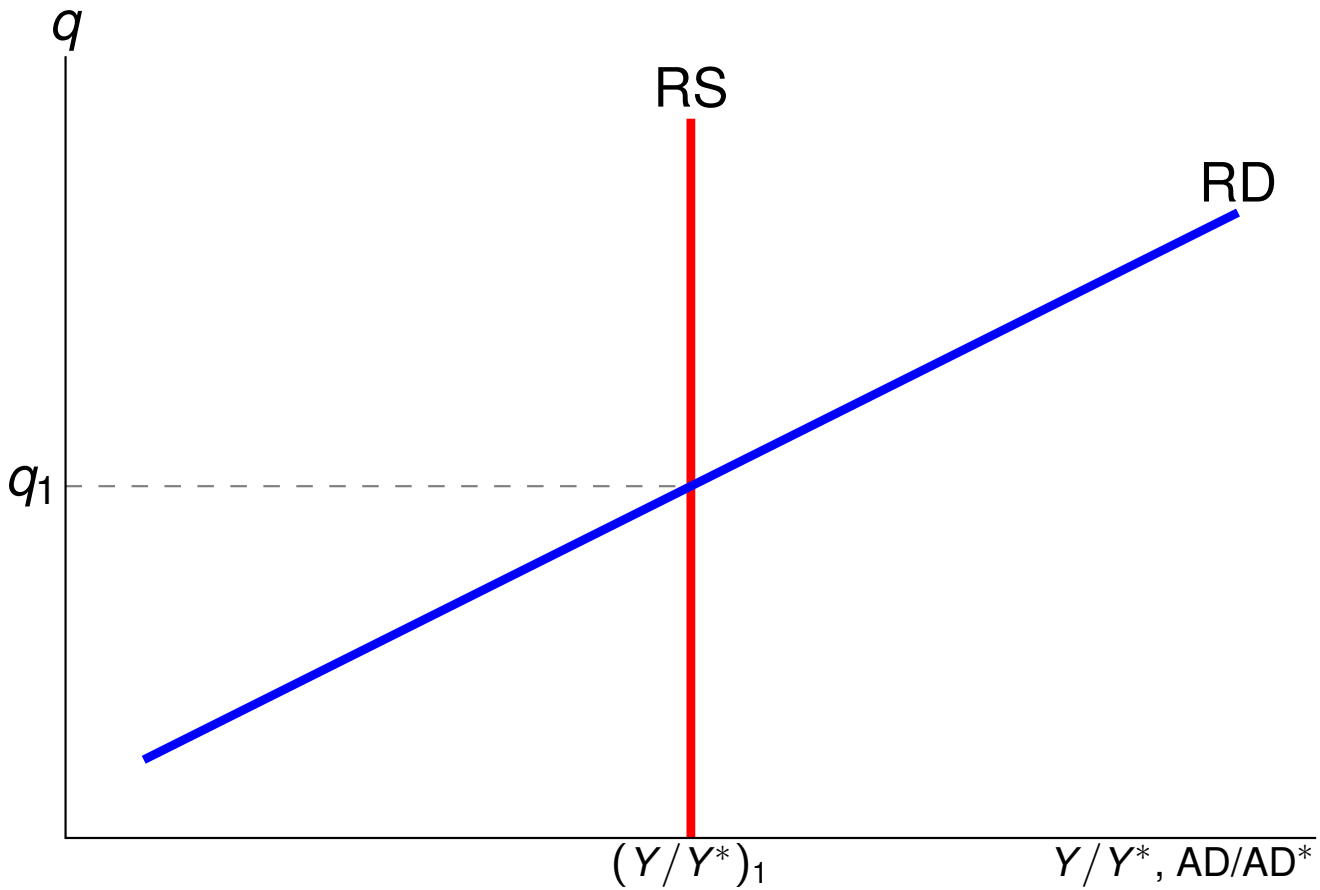
Note: Relative demand depends on relative prices (i.e., on prices or exchange rates), but relative output does not.

LR Equilibrium Real Exchange Rate

LR Equilibrium: relative supply matches the relative demand (so there is no tendency for the relative price to change).

$$Y/Y^* = \mathrm{AD}/\mathrm{AD}^*$$

Determination of the Long-Run Real Exchange Rate



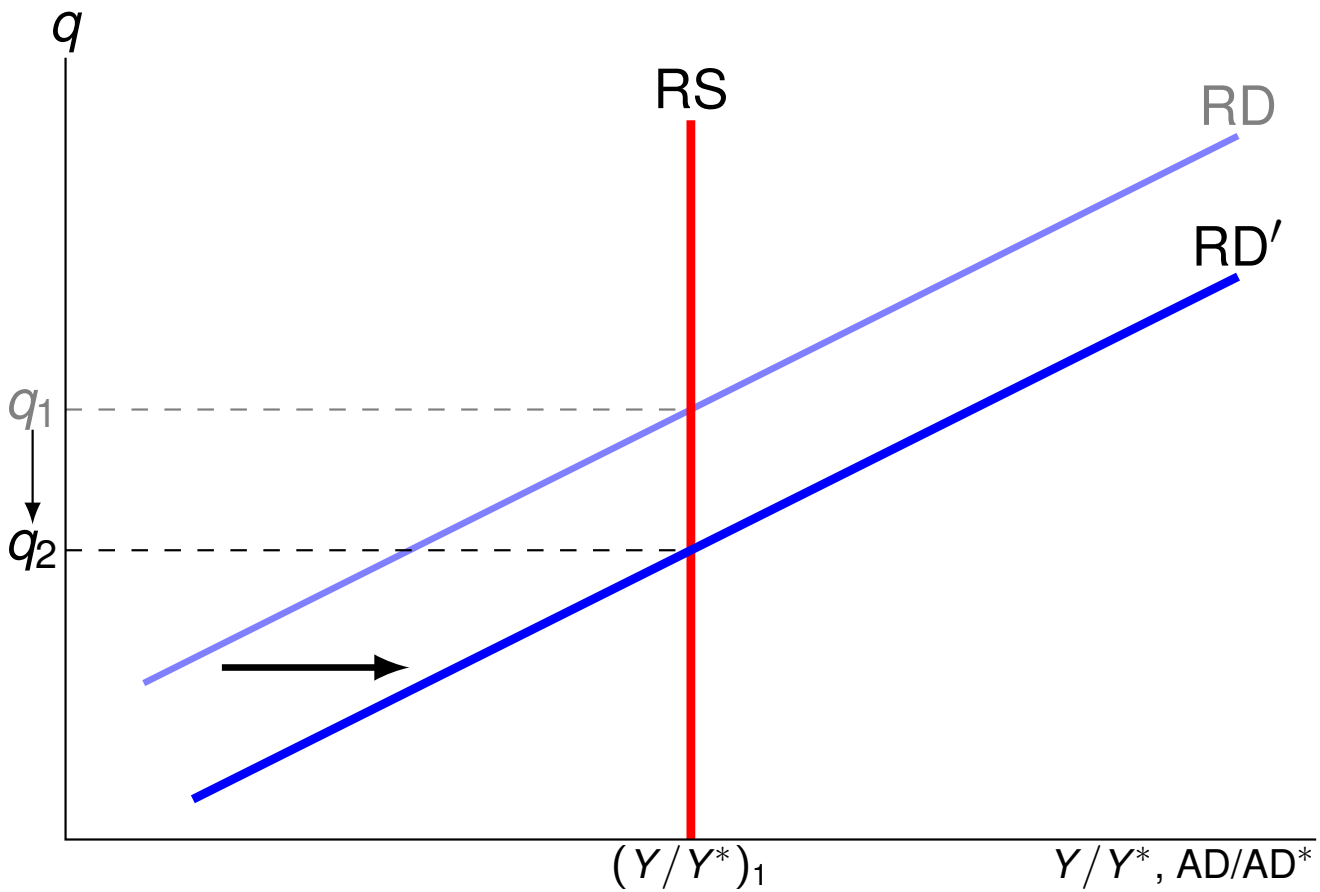
Compare KOMIE 16-4 (KOMIF Fig 5-4).

Demand Shocks and LRRER

Situation: an increase in relative demand for domestic products

- ($\uparrow$Ex or $\downarrow$Im) $\rightarrow \downarrow$q
  - a real appreciation of the domestic currency
  - this is a rise in the price of domestic goods (P) relative to the price of foreign goods (EP*)
- real appreciation makes our exports more expensive and our imports less expensive
  $\rightarrow \downarrow$ relative demand
  $\rightarrow$ restoring equilibrium

Demand Shocks and LRRER

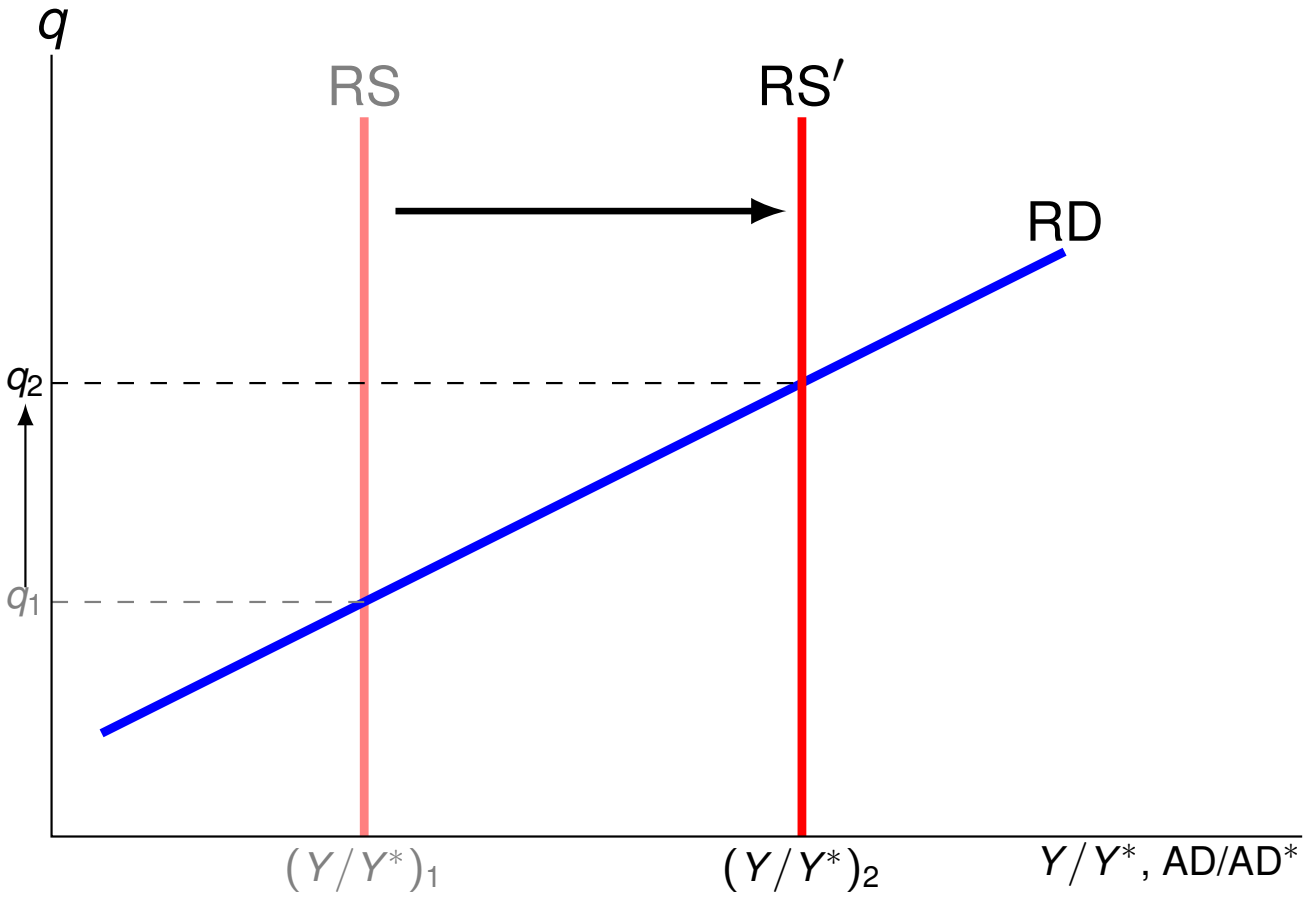


Supply Shocks and LR RER

Situation: an increase in relative supply of domestic US products

- ($\uparrow$Y or $\downarrow$Y*) $\rightarrow \uparrow$q
  - a real depreciation of the domestic currency
  - this is a rise in the price of foreign goods (EP*) relative to the price of domestic goods (P)
- real depreciation makes our exports less expensive and our imports more expensive
  $\rightarrow \uparrow$ relative demand
  $\rightarrow$ restoring equilibrium

Supply Shocks and LRRER



The LR RER (Summary)

Endogenizing the real exchange rate

- produces a more general model of exchange rate determination

The monetary approach still applies:

- increases in monetary levels leading to price level increases.
- increases in monetary growth rates lead to persistent inflation (and corresponding changes in expectations).

But now real factors also matter:

- increases in relative demand for domestic products leads to a real appreciation.
- increases in relative supply of domestic products leads to a real depreciation.

Nominal Exchange Rate Determination Redux

How does this change our theory of nominal exchange rate determination?

$E = q P / P^*$

Monetary shocks

- PPP still holds
- we have the same predictions as before.
- no changes in the real exchange rate

Real demand shocks

- the real exchange rate changes ($\uparrow AD \rightarrow \downarrow q$)
- the nominal exchange rate adjusts to produce the equilibrium real exchange rate

Real output shocks

- the real exchange rate changes ($\uparrow Y \rightarrow \uparrow q$)
- the nominal exchange rate situation is more complex. . .

The Real Exchange Rate Approach to Exchange Rates (cont.)

- With an increase in the relative supply of domestic products, the real exchange rate adjusts to make the price/cost of domestic goods depreciate, but also the relative amount of domestic output increases. - This second effect increases the demand of real monetary assets in the domestic economy:

  $P = M / L(R,Y)$

  - Thus level of average domestic prices is predicted to decrease relative to the level of average foreign prices.
  - The effect on the nominal exchange rate is ambiguous:

    $E = q\ P / P^*$

LR Model Summary: Effects of Money Market and Output Market Changes on E

- $\uparrow$ M $\rightarrow$ proportional $\uparrow$E
- $\uparrow$ M* $\rightarrow$ proportional $\downarrow$E
- $\uparrow$ AD $\rightarrow$ $\downarrow$ E
- $\uparrow$ AD* $\rightarrow$ $\uparrow$ E
- $\uparrow$ Y $\rightarrow$? E
- $\uparrow$ Y* $\rightarrow$? E

Compare KOMIF Table 16-1 (KOMIE 16-1)

Summary

The law of one price:

- the same good in different competitive markets must sell for the same price
- (Assume: transportation costs and barriers between markets are not important.)

Purchasing power parity:

Absolute PPP:

- the law of one price for price indexes
- changing currencies does not change your purchasing power.

Relative PPP the nominal exchange rate moves with relative price levels

Summary (cont.)

monetary approach to flexible exchange rates:

- assumes PPP and the Classical theory of prices
- Changes in the growth rate of the money supply influence inflation and exchange rates.
- Expectations about inflation influence the exchange rate.
- The Fisher effect shows that differences in nominal interest rates are equal to differences in inflation rates.

Empirical support for PPP:

Weak in the short run, due to trade barriers, non-tradable products, imperfect competition and differences in price measures.

Stronger in the LR, for relative PPP

Summary: Real Interest Parity

Real interest rate: inflation-adjusted interest rate
(how much **purchasing power** savers gain and borrowers give up)

Real interest parity: says that real interest rate differential equals expected rate of real exchange rate depreciation
should hold under expected PPP

Summary (cont.)

real exchange rate: the domestic product cost of foreign products.

real exchange rate approach to exchange rates (RS-RD):

- predicts that changes in relative demand and relative supply of products influence real and nominal exchange rates.
- generalizes the monetary approach (allows PPP violations)
- threfore, may allow deviations from real interest parity (since real interest rate differences equal the expected change in the real exchange rate)