Chapter 4 Lecture Notes: Economics for MBAs and Masters of Finance

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Meet

Bjørn

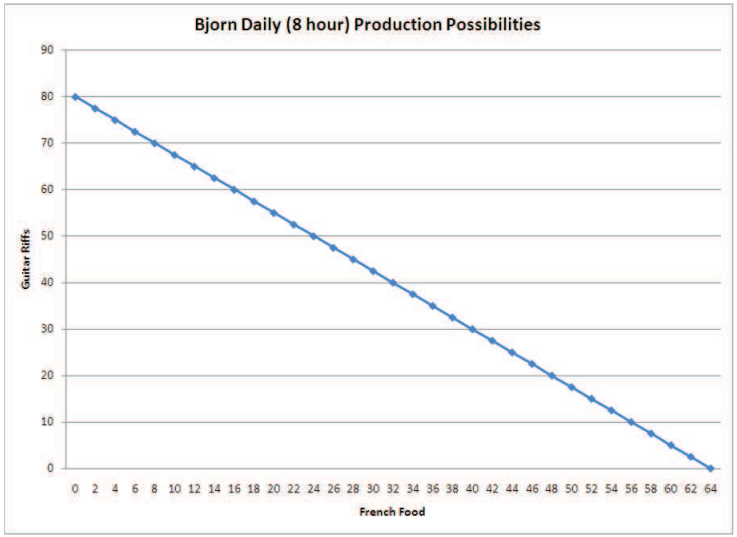
François

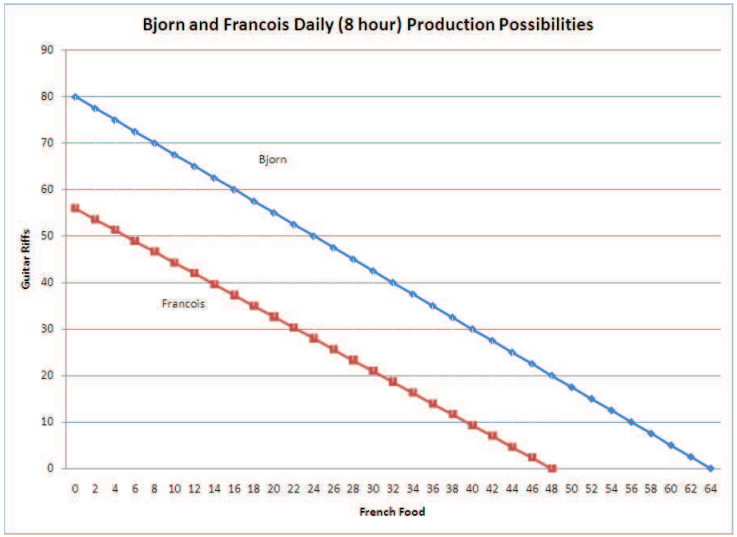
Bjørn and François like to consume guitar riffs and French food.

They both can produce guitar riffs and French food, but at different degrees of competence.

Table: Bjørn and François Production Possibilities

	Bjørn	François
Guitar Riffs	10/hour	7/hour
French Food	8/hour	6/hour





Suppose Bjørn and François live in "Autarky."

Autarky is a situation in which no trade occurs. Each consumes what he produces.

Table: Bjørn and François Production: Autarky

	Bjørn			François			
	output per hour	hours	total	output per hour	hours	total	total
Guitar Riffs	10	4	40	7	4	28	68
French food	8	4	32	6	4	24	56

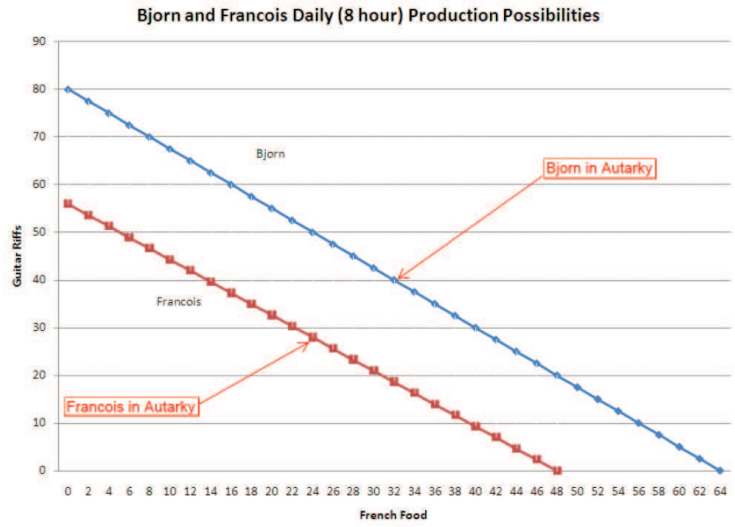


Table: Bjørn and François Production Possibilities

	Bjørn	François
Guitar Riffs	10/hour	7/hour
French Food	8/hour	6/hour

Open question:
Can Bjørn and François **both** improve their standard of living (by trade)?

Yes!

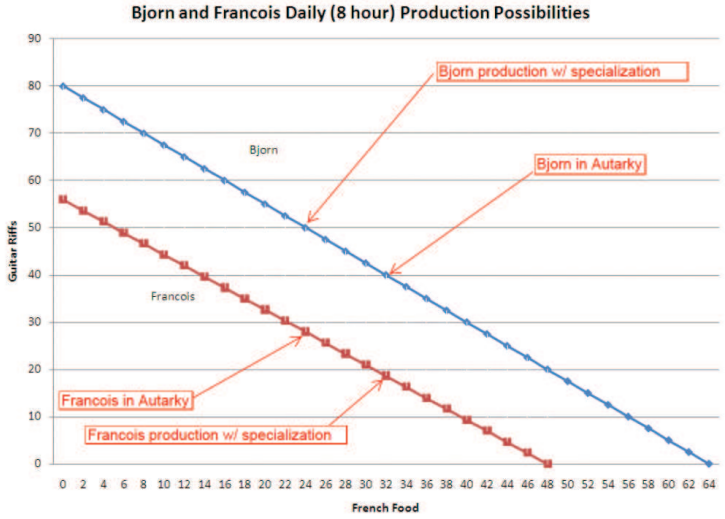
Consider an allocation where

- Bjørn: +1 hour on guitar, -1 hour on French food
- François: -4/3 hour on guitar, +4/3 hour on French food

What do you notice?

Table: Bjørn and François Production with Some Specialization

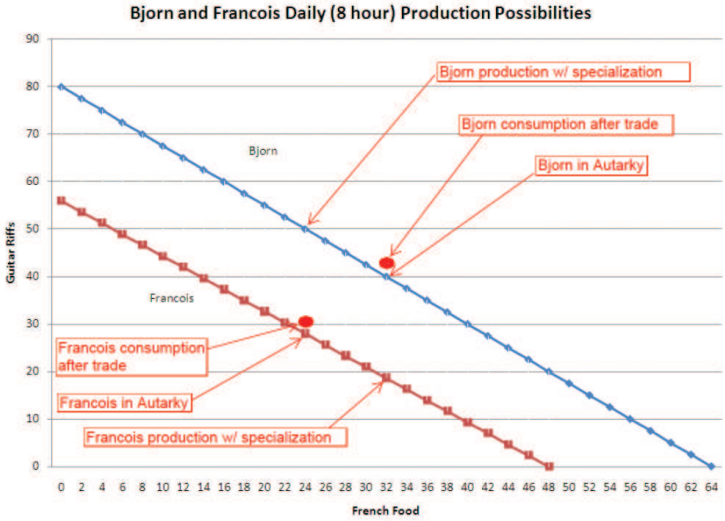
	Bjørn			François			
	output per hour	hours	total	output per hour	hours	total	total
Guitar Riffs	10	5	50	7	$2\frac{2}{3}$	$18\frac{2}{3}$	$68\frac{2}{3}$
French food	8	3	24	6	$5\frac{1}{3}$	32	56



Suppose Bjørn and François agree to evenly split the gains from specialization. They are both better off.

Table: Bjørn and François Production and Consumption after Some Specialization

	Bjørn			François		
	produc.	consum.	produc. − consum.	produc.	consum.	produc. − consum.
Guitar	50	$40\frac{1}{3}$	$+9\frac{2}{3}$	$18\frac{2}{3}$	$28\frac{1}{3}$	$-9\frac{2}{3}$
Food	24	32	-8	32	24	$+8$



Trade is magic.

Bjørn and François are each better off after trade (than compared to autarky). They each work 8 hours, consume the same amount of food (as in autarky), but each consume more guitar riffs.

Trade makes both better off because all trade is voluntary.

This is an important lesson about trade and about economics.

- Negotiations are zero sum: If you get more, I get less.
- Trade is not zero sum. Trade enables us to all get more.

The reason that Bjørn and François can benefit from trade is that they have relatively different skills.

→ The implicit price of guitar riffs, in units of food, differs.

Holding total hours worked constant:

- For Bjørn to make one more guitar riff, he must give up $8/10 = 0.80$ units of food.
- For François to make one more guitar riff, he must give up $6/7 = 0.86$ units of food.

This gap in relative prices leads to opportunities for trade. A "trader" could buy one guitar riff from Bjørn for 0.80 units of food and sell that guitar riff to François for 0.86 units of food.

Notice the patterns of trade:

	Exports	Imports
Bjørn	$9\frac{2}{3}$ guitar	8 food
François	8 food	$9\frac{2}{3}$ guitar

Bjørn exports guitar riffs because he is the low cost (0.80) producer. (This is what the trader would do).

Françcois exports food because he is the low cost producer. (What is the cost of 1 unit of food in units of guitar riffs?).

After trade, the relative price of guitar riffs is the same in both countries. In this example, the agreed-upon price of 1 guitar riff in units of food after trade is 0.83 – inbetween the Bjørn and François price in Autarky.

Notice I have not said anything about countries.

I have just talked about two nuts named Bjørn and François. They could be two guys next door, or your professors.

Trade is about efficiency. We do not all fix cars, build airplanes, run numbers, grow wood etc. We engage full time in a chosen profession in which we have a relative cost advantage. We sell our work and then buy the work of others (i.e. trade in a centralized marketplace). This maximizes our income holding hours worked fixed.

In this sense, there is no difference between international trade, and trade between agents in the same country.

In this example, we assumed the value of all guitar riffs Bjørn exported to François was equal to the value of all French food François exported to Bjørn.

Neither agent walked away with a trade deficit. A trade deficit occurs if one agent sells goods and services of greater value than the goods or services he receives.

In this case, the party receiving the more valuable shipment writes a note promising to pay the remaining balance at some point in the future. This note is a financial asset.

Thus a trade deficit occurs whenever (at the country level) goods and services are exchanged, at least in part, for financial assets.

Stylized recent example:

	Exports	Imports
China	\$100 of iPods	\$80 of Software
U.S.	\$80 of Software	\$100 of iPods

U.S. has run a trade deficit of \$20 with China – Chinese citizens now hold \$20 more in U.S. dollars than they did prior to trade.

This \$20 is a financial asset to the Chinese (and a financial liability to U.S. citizens): It entitles Chinese citizens to the right to buy U.S. goods, services, or assets at any point in the future.

Accounting Identity:

$$\begin{array}{ccccc} \text{Current Account} & + & \text{Capital Account} & = & 0 \\ -\$20 & + & \$20 & = & 0 \end{array}$$

- Current Account:
  value of exports (\$80) less value of imports (-\$100)
- Capital Account: change to claims on US assets held by foreigners less change to claims on foreign assets held by U.S. residents.

This equation is an identity because when person x agrees to sell goods to person y for \$100, person x must receive some combination of goods and financial assets worth \$100 in return.

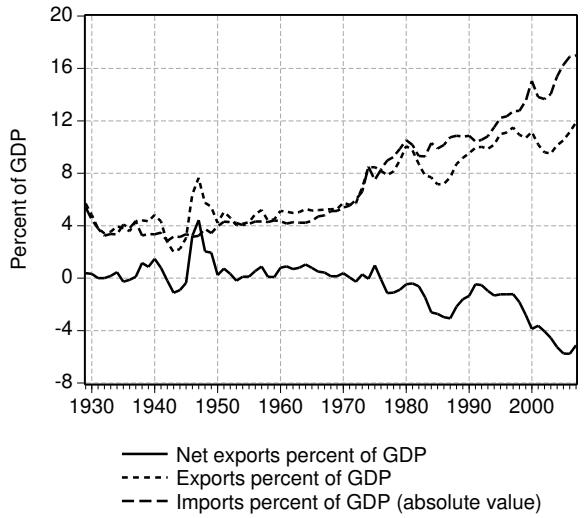
US, 2007:

- Exports \$1,662.4 billion
- Imports \$2,370.2 billion
- NX -\$707.8 billion

U.S. Exports and Imports of Goods in \$ Millions in 2007 by Major Region

	Exports	Imports	NX (goods)
Europe	\$280,845	\$411,179	-\$130,334
Canada	\$249,712	\$320,323	-\$70,611
Latin America	\$243,063	\$348,378	-\$105,316
Asia and Pacific	\$308,248	\$718,562	-\$410,314
Middle East	\$43,646	\$77,405	-\$33,759
Africa	\$22,966	\$92,005	-\$69,039
Total	\$1,148,481	\$1,967,853	-\$819,373

Net Exports, Exports, and Imports as a Percent of Nominal GDP, 1929-2007



What is an asset?

An asset is a claim to consumption in the future.

- Put money in bank (financial asset). Can withdraw money to buy consumption at any point in the future.

Trade deficit: Trade of goods today for financial assets

- Trade of consumption today for future consumption.

Why would residents of a country run a trade deficit (i.e. trade of goods for assets) with residents of another country?

Irresponsibility?

Could there be benefits?

Two countries North and South with different growing seasons.

Table: North and South Production Possibilities of Tons of Food

	North	South
Apr. - Sep.	100	20
Oct. - Mar.	20	100

Food is not storable: Residents must eat the food when it is grown.

Could both North and South be better off with trade?

Under standard assumptions about the marginal utility of food, residents of North and South find it beneficial to trade:

Table: North and South Production and Consumption after Trade

	North			South		
	prod.	cons.	prod. − cons.	prod.	cons.	prod. − cons.
Apr. - Sep.	100	60	+40	20	60	−40
Oct. - Mar.	20	60	−40	100	60	+40

Notice in each season the trade of goods for assets:

- North: trade surplus Apr - Sep, trade deficit Oct - Mar
- South: trade deficit Apr - Sep, trade surplus Oct - Mar

Trade acts like a storage technology.

Recall that when we discussed goods-goods trade, we noticed that when there is a difference in relative prices there are opportunities for trade.

The same idea is at work here. Although storage does not exist, we could ask how much residents would be willing to pay (WTP) for storage in each season.

	WTP for Storage	
	Apr - Sep	Oct - Mar
North	High	Low
South	Low	High

Differences in WTP for storage lead to trading opportunities.

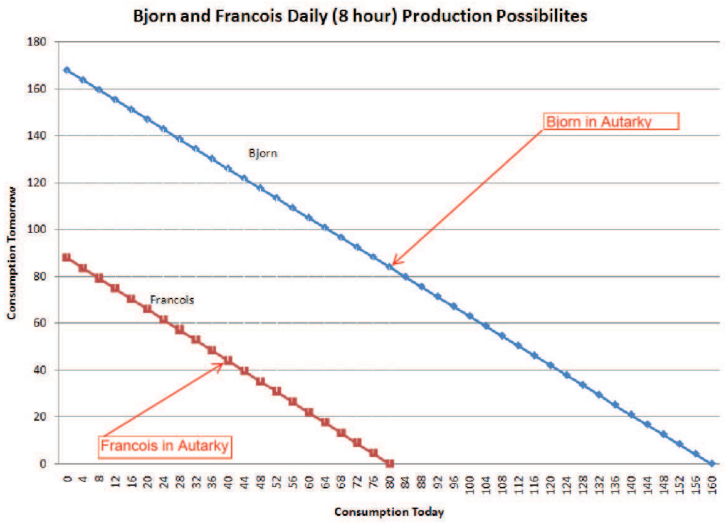
Let's expand on the idea of WTP for storage.

Suppose Bjørn and François make 2 goods:
"Consumption today" C_t and "Consumption tomorrow" C_{t+1}.

Consider their production and consumption in Autarky:

Table: Bjørn and François Production: Autarky

	Bjørn			François			
	output per hour	hours	total	output per hour	hours	total	total
C_t	20	4	80	10	4	40	120
C_{t+1}	21	4	84	11	4	44	128



Are there gains from trade?

	Output per Hour	
	Bjørn	François
C_t	20	10
C_{t+1}	21	11

- If Bjørn wants $+1$ of C_t, how much C_{t+1} must he forego?
- If François wants $+1$ of C_t, how much C_{t+1} must he forego?

- In which good is Bjørn's cost advantage? What about François?
- How could a trader make profits here?

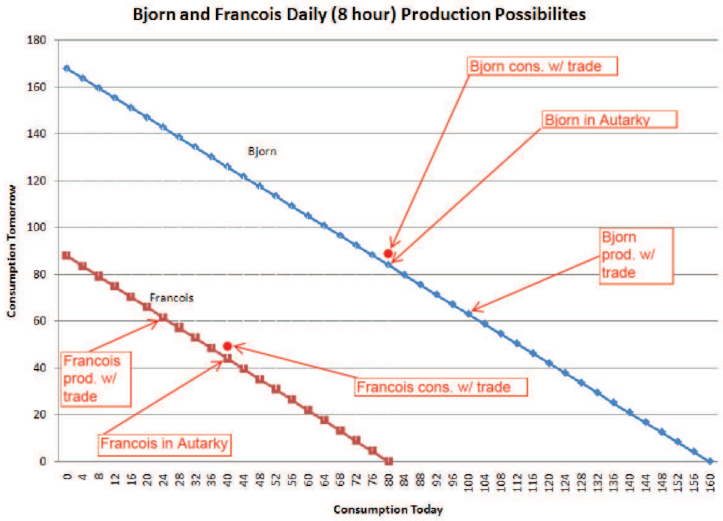
Suppose Bjørn and François agree to:

- Specialize in production and
- Evenly split the gains from trade.

They are both better off compared to Autarky: C_t is same, C_{t+1} is up.

Table: Bjørn and François Prod. and Cons. after Some Specialization

	Bjørn			François		
	prod.	cons.	prod. − cons.	prod.	cons.	prod. − cons.
C_t	100	80	$+20$	20	40	-20
C_{t+1}	63	$84\frac{1}{2}$	$-21\frac{1}{2}$	66	$44\frac{1}{2}$	$+21\frac{1}{2}$



What would journalists say about François?

	Bjørn			François		
	prod.	cons.	prod. − cons.	prod.	cons.	prod. − cons.
C_t	100	80	$+20$	20	40	-20
C_{t+1}	63	$84\frac{1}{2}$	$-21\frac{1}{2}$	66	$44\frac{1}{2}$	$+21\frac{1}{2}$

- Period t: Running a huge deficit. "Mortgaging future."
- Period $t+1$: Paying for earlier excesses.

What do you think about this?

Let's study budget constraints to make clear the link between goods-goods trade and goods-assets trade.

Suppose a person's income is $Y(1+r)$ with which they use to buy food and guitar riffs.

$$\underbrace{Y(1+r)}_{\text{Income}} = \underbrace{p_g * g}_{\text{Guitar Expenditures}} + \underbrace{p_f * f}_{\text{Food Expenditures}}$$

Price to buy one unit of guitars, in units of food, is $\frac{p_g}{p_f}$.

Now suppose that a person makes income today that can either be spent on consumption today, or saved at rate r for the purposes of spending on consumption tomorrow.

$$\begin{aligned}(1+r)(Y-C_t) &= C_{t+1}\\ (1+r)Y-(1+r)C_t &= C_{t+1}\end{aligned}$$

$$\underbrace{Y(1+r)}_{\text{Income}} = \underbrace{(1+r)*C_t}_{C_t \text{ Expenditures}} + \underbrace{1*C_{t+1}}_{C_{t+1} \text{ Expenditures}}$$

Price to buy one unit of C_t, in units of C_{t+1}, is $\frac{1+r}{1}$.

Earlier (goods-goods) example:
Bjørn and François have different $\frac{p_g}{p_f}$.

Current (goods-assets) example:
Bjørn and François have different $\frac{1+r}{1}$.

In both cases, different relative prices lead to opportunities to trade. Trade has the potential to make both Bjørn and François better off.

Recall from chapter 2: Cobb-Douglas production

$$Y_t = z_t K_t^{\alpha} L_t^{1-\alpha}, \quad 0<\alpha<1\ .$$

Profit maximization implies

$$\begin{aligned}w_t &= (1-\alpha)\ z_t\ K_t^{\alpha}\ L_t^{-\alpha}\\ r_t &= \alpha\ z_t\ K_t^{\alpha-1}\ L_t^{1-\alpha}\end{aligned}$$

where w_t is the hourly wage rate and r_t is the pre-tax, pre-depreciation rental rate on a unit of capital.

Suppose prior to trade that a country has r_t greater than the worldwide rate $\bar{r}$.

If capital is mobile, after trade (period t+1) $r_{t+1} = \bar{r} > r_t$.

Suppose z_t and L_t do not change between periods t and t+1.

$$\begin{aligned} \frac{r_{t+1}}{r_t} &= \left(\frac{K_{t+1}}{K_t}\right)^{\alpha-1} \\ &= \left(\frac{K_{t+1}}{K_t}\right)^{1-\alpha} \end{aligned}$$

$r_{t+1} > r_t$ and $1 - \alpha > 0$ implying $K_{t+1} > K_t$.

What does this imply for wages?

Suppose z_t and L_t do not change between periods t and t+1 (as before). This implies

$$\frac{w_{t+1}}{w_t} = \left(\frac{K_{t+1}}{K_t}\right)^{\alpha}.$$

Since $K_{t+1} > K_t$ and $\alpha > 0$ then $w_{t+1} > w_t$.
Hourly wages increase.

Summary of Consequences of Trade
on Factors of Production and Factor Prices
(depends on whether r_t less than or greater than worldwide rate)

	$r_t > \bar{r}$	$r_t < \bar{r}$
Interest rates	Decrease	Increase
Capital	Increase	Decrease
Wage Rate	Increase	Decrease

Covered Interest Parity:

A condition on interest rates, the current exchange rate, and the contracted forward exchange rate that ensures that the effective rate of return on capital in any two countries is identical.

Suppose

- U.S. risk-free rate is 10%.
- English risk-free rate is 5%.
- Current exchange rate is \$2 = £1.
- 1-year ahead forward exchange rate is also \$2 = £1.

This implies a trader can make risk-free profits:

1. Borrow £1.00 from English bank with £1.05 to be repaid at end of year.
2. Convert £1.00 to \$2.00 at current exchange rate.
3. Lock in one-year ahead forward exchange rate at £1.00 for \$2.00.
4. Invest \$2.00 in U.S. for 1 year, receive \$2.20 at end of year.
5. Convert \$2.20 back to £1.10.
6. Pay back £1.05 to English bank and keep £0.05 as profit.

To eliminate potential for risk-free profits, in this example the 1-year ahead forward rate must be different than the current exchange rate.

In the event the true risk-free rate is 5% in both countries, then at the end of the year \$2.20 must be converted to £1.05.

This implies the one-year ahead forward rate must specify £1 be convertible to \$2.095 = \$2.20/£1.05.

Exact expression to ensure no risk-free profits:

$$(1 + i_{\$})\ S_{\$/£} \quad = \quad (1 + i_{£})\ F_{\$/£}$$

- $i_{\$}$ is the annual rate of interest at U.S. banks.
- $i_{£}$ is the annual rate of interest at English banks.
- $S_{\$/£}$ is the "spot" (i.e. current) exchange rate of dollars.
- $F_{\$/£}$ is the contracted one-year ahead forward exchange rate of \$ U.S. per £.

For example:

$$\begin{aligned}(1 + i_{\$})\ S_{\$/£} &= (1 + i_{£})\ F_{\$/£} \\ (1.10)\ 2.000 &= (1.05)\ 2.095\ .\end{aligned}$$

Forward rate contracts specify that the U.S. dollar depreciates whenever the risk-free rate offered in the U.S. is higher than in other countries.

If \$/£ increases, then one £ buys more \$U.S.
This is a depreciation of the U.S. \$.

Covered Interest Parity is a condition about the change in exchange rates.

Purchasing Power Parity (PPP) is a condition about the level of exchange rates.

- The price of a Big Mac is £1.00 in England.
- Big Macs are free to transport and there are no taxes or tariffs.
- Price of a Big Mac is \$2.00 in the U.S.
- PPP exchange rate should be £1.00 = \$2.00 U.S.

In practice:
PPP exchange rates are computed using a basket of goods.

Consider the example of Covered Interest Parity.

Suppose actual rate in 1 year is equal to forward rate:

- Exchange rate 1/1/2007 \$2.00 = £1.00.
- Exchange rate 12/31/2007 \$2.095 = £1.00.

Now suppose that Big Mac PPP holds

	Jan 1, 2007 Big Mac Price	Dec. 31, 2007 Big Mac Price	Inflation Rate
England	£1.00	£1.00	0.00%
U.S.	\$2.00	\$2.095	4.75%

Interaction of Covered Interest Parity, Purchasing Power Parity, and Inflation Rates are related to "Fisher Equation."

$$(1+i) \quad = \quad (1+r)*(1+\pi) \ .$$

- i is nominal interest rate,
- r is real interest rate, and
- π is inflation rate.

Nominal interest rate differentials in risk-free rates reflect differences in inflation.

$$\begin{array}{rrcl} & (1+i) & = & (1+r)*(1+\pi) \\ \text{England} & (1.05) & = & (1.05)*(1.00) \\ \text{U.S.} & (1.10) & = & (1.05)*(1.0475) \end{array}$$

- Covered interest parity holds,
- PPP holds, and
- Real risk-free rate r is the same in both countries.