



International Finance

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037/641 4140

The Market for Foreign Exchange

Quotation of the exchange rate

Arbitrage

Exercise A:

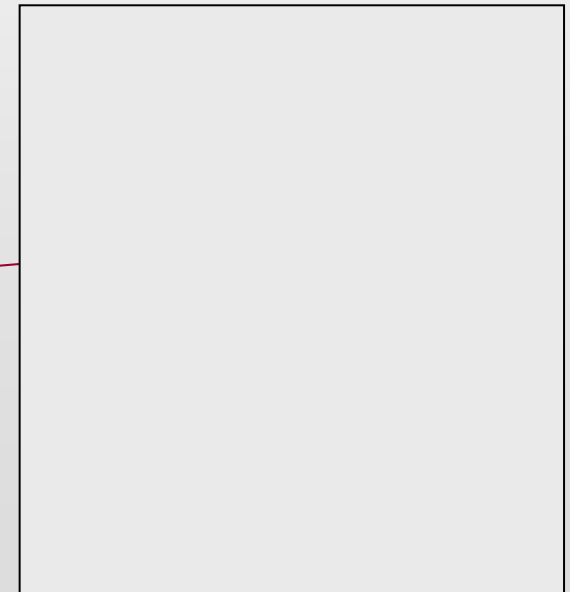
(Balance of Payments)

- includes all imports and exports of goods and services and unilateral transfers of foreign aid.
- are those that record all transactions between the residents of a country and residents of all foreign nations.
- is the statistical record of a country's international transactions over a certain period of time presented in the form of double-entry bookkeeping.
- is composed of Foreign Direct Investment (FDI), portfolio investments and other investments.
- includes gold, foreign currency, SDRs, reserve positions in the IMF.

Exercise B:

(Balance of Payments)

		Credits	Debits
Current Account			
1	Exports	\$1,167.61	
2	Imports		(\$1,295.53)
3	Unilateral Transfers	\$6.13	(\$45.01)
	Balance on Current Account		
Capital Account			
4	Direct Investment	\$107.93	(\$119.44)
5	Portfolio Investment	\$387.62	(\$79.28)
6	Other Investments	\$194.95	(\$227.2)
	Balance on Capital Account		
7	Statistical Discrepancies		(\$96.76)
	Overall Balance		
Official Reserve Account			



Exercise C:

a) Fill in the tables:

October 2001

	X/EUR	EUR/X
GBP	0.61	?
CAD	1.43	?
JPY	111.1	?
MXN	8.7	?
RUB	27.03	?

October 2002

	X/EUR	EUR/X
GBP	0.63	?
CAD	1.56	?
JPY	120.48	?
MXN	10	?
RUB	31.25	?

Exercise C:

b) Calculate prices of the following goods in EUR by the records in the previous tables:

- 1) pullover = 72,- CAD (Toronto)
- 2) hotel room = 39 000,- JPY (Tokyo)
- 3) hat = 2 700,- RUB (Moscow)
- 4) skirt = 260,- MXN (Mexico City)
- 5) suit = 120,- GBP (London)

Exercise D:

(cross mid-point rate)

Calculate the cross rate EUR/USD if you know the following rates:

22.328 CZK/USD

29.550 CZK/EUR

From the quotation of the domestic currency to the foreign currencies we can calculate the exchange rate of that foreign currencies.

Exercise E:

(Arbitrage)

Suppose that there is the participant on the market whose quotation of the EX rate is different (0.766 EUR/USD) than the cross rate (0.756 EUR/USD – from exercise D).

That means the arbitrage is possible.

Calculate the triangular arbitrage, if you know the following rates and you have disposable income 1,000 CZK:

22.328 CZK/USD

29.550 CZK/EUR

0.766 EUR/USD

Exercise E:

(Arbitrage)

		1)	2)	3)
Transaction	-			
Capital	1,000 CZK			

ARBITRAGE – the simultaneous buying and selling of two or more currencies in different markets for purposes of gain.

Exercise F:

(cross rate – bid/offer)

Suppose that there are two banks on the market (Beta, Gama).
They are listing following EX rates:

				BID	OFFER
Beta	$SR_{A/B}$	=	$SR_{CZK/USD}$	=	21.904 – 22.752 CZK/USD
Gama	$SR_{A/C}$	=	$SR_{CZK/EUR}$	=	29.018 – 30.082 CZK/EUR

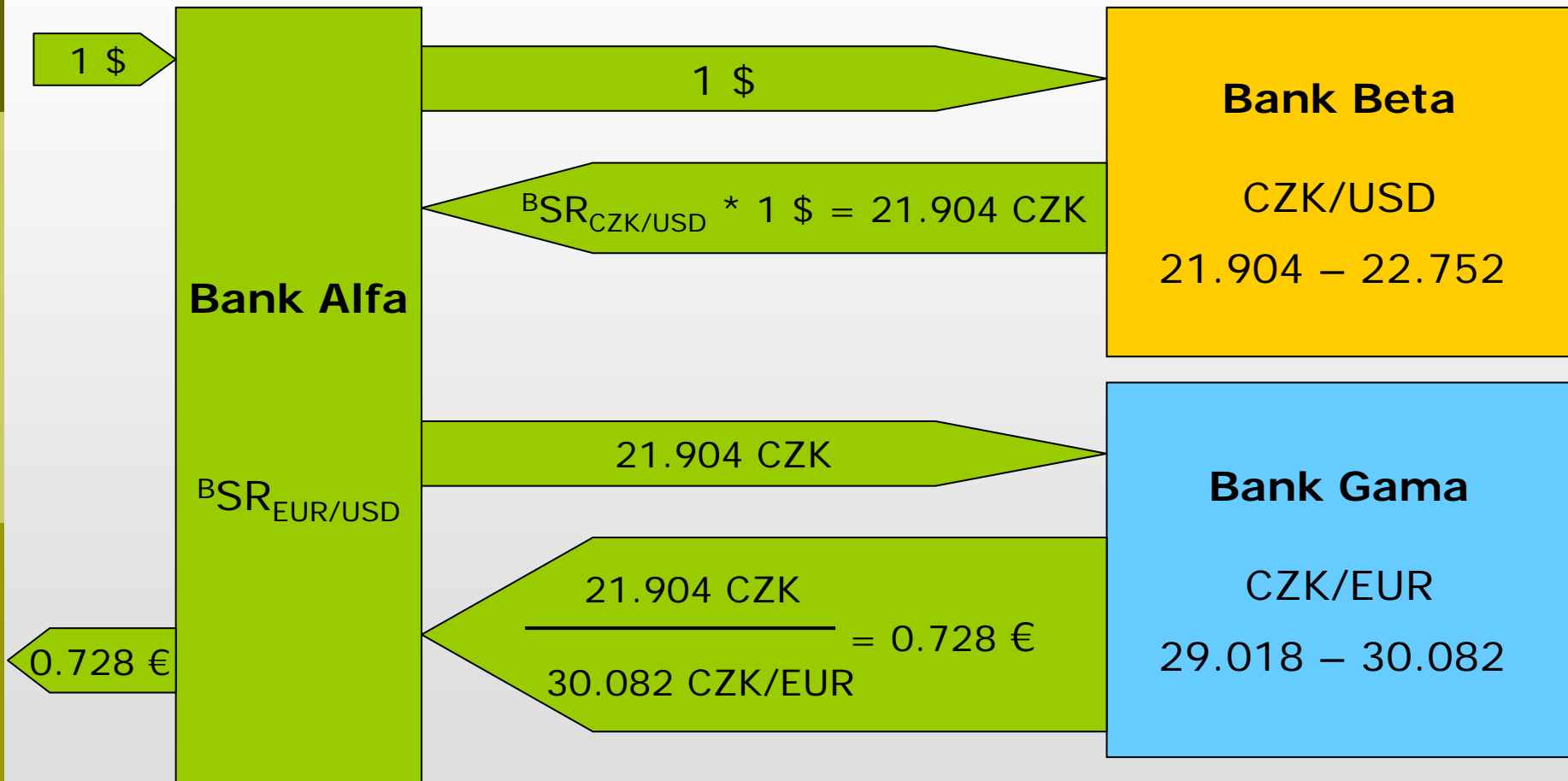
Bank Alfa wants to know the BID cross rate ${}^B SR_{EUR/USD}$!

Calculate it!

$${}^B SR_{C/B} = \frac{{}^B SR_{A/B}}{{}^O SR_{A/C}}$$

Exercise F: - results

(derivation of the cross rate – bid/offer)



The Function and Structure of the FOREX Market

FOREX Market is:

- Interbank Market (Wholesale)
- Client Market (Retail)

Market participants include international banks, their customers, nonbank dealers, FOREX brokers and central banks.

International commercial banks communicate with one another with:

- SWIFT: *the **S**ociety for **W**orldwide **I**nterbank **F**inancial **T**elecommunications*
- CHIPS: ***C**learing **H**ouse **I**nterbank **P**ayments **S**ystem*
- ECHO: ***E**xchange **C**learing **H**ouse **L**imited*, the first global clearinghouse for settling interbank FOREX transactions.

Spot Rate Quotations

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- Direct quotation
 - the U.S. dollar equivalent
 - *e.g.* "a Japanese Yen is worth about a penny"

- Indirect Quotation
 - the price of a U.S. dollar in the foreign currency
 - *e.g.* "you get 100 yen to the dollar".

Spot Rate Quotations

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Wednesday, January 8, 1997

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Country	U.S. \$ equiv.		Currency per U.S. \$	
	Wed.	Tues.	Wed.	Tues.
Argentina (Peso)	1.0012	1.0012	.9988	.9988
Australia (Dollar)	.7805	.7902	1.2812	1.2655
Austria (Schilling)	.09043	.09101	11.058	10.988
Bahrain (Dinar)	2.6525	2.6525	.3770	.3770
Belgium (Franc)	.03080	.03105	32.470	32.205
Brazil (Real)	.9607	.9615	1.0409	1.0401
Britain (Pound)	1.6880	1.6946	.5924	.5901
30-Day Forward	1.6869	1.6935	.5928	.5905
90-Day Forward	1.6843	1.6910	.5937	.5914
180-Day Forward	1.6802	1.6867	.5952	.5929
Canada (Dollar)	.7399	.7370	1.3516	1.3568
30-Day Forward	.7414	.7386	1.3488	1.3539
90-Day Forward	.7442	.7413	1.3437	1.3489
180-Day Forward	.7479	.7450	1.3370	1.3422
Chile (Peso)	.002352	.002356	425.25	424.40
China (Renminbi)	.1201	.1201	8.3272	8.3276
Colombia (Peso)	.0009985	.0009985	1001.50	1001.50
Czech. Rep (Krouna)	.....	.....	.....	.....
Commercial rate	.03662	.03677	27.307	27.194
Denmark (Krone)	.1663	.1677	6.0118	5.9633
Ecuador (Sucre)	.....	.....	.....	.....
Floating rate	.0002766	.0002787	3615.00	3587.50
Finland (Markka)	.2121	.2135	4.7150	4.6841
France (Franc)	.1879	.1893	5.3220	5.2838
30-Day Forward	.1882	.1896	5.3126	5.2741
90-Day Forward	.1889	.1903	5.2935	5.2558
180-Day Forward	.1901	.1914	5.2617	5.2243
Germany (Mark)	.6352	.6394	1.5744	1.5639
30-Day Forward	.6364	.6407	1.5714	1.5607
90-Day Forward	.6389	.6432	1.5652	1.5547
180-Day Forward	.6430	.6472	1.5552	1.5450
Greece (Drachma)	.004049	.004068	246.98	245.80
Hong Kong (Dollar)	.1292	.1292	7.7390	7.7390
Hungary (Forint)	.006139	.006164	162.89	162.23
India (Rupee)	.02787	.02786	35.875	35.890
Indonesia (Rupiah)	.0004233	.0004233	2362.15	2362.63
Ireland (Punt)	1.6664	1.6714	.6001	.5983
Israel (Shekel)	.3079	.3085	3.2474	3.2412
Italy (Lira)	.0006483	.0006510	1542.50	1536.00

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Japan (Yen)	.008639	.008681	115.75	115.20
30-Day Forward	.008676	.008718	115.26	114.71
90-Day Forward	.008750	.008791	114.28	113.76
180-Day Forward	.008865	.008907	112.80	112.28
Jordan (Dinar)	1.4075	1.4075	.7105	.7105
Kuwait (Dinar)	3.3367	3.3389	.2997	.2995
Lebanon (Pound)	.0006445	.0006445	1551.50	1551.50
Malaysia (Ringgit)	.4018	.4002	2.4885	2.4990
Malta (Lira)	2.7624	2.7701	.3620	.3610
Mexico (Peso)	.....	.....	.....	.....
Floating rate	.1278	.1277	7.8220	7.8330
Netherlands (Guilder)	.5655	.5699	1.7685	1.7547
New Zealand (Dollar)	.7072	.7106	1.4140	1.4073
Norway (Krone)	.1540	.1548	6.4926	6.4599
Pakistan (Rupee)	.02529	.02529	39.540	39.540
Peru (new Sol)	.3814	.3820	2.6218	2.6039
Philippines (Peso)	.03800	.03802	26.318	26.300
Poland (Zloty)	.3460	.3475	2.8900	2.8780
Portugal (Escudo)	.006307	.006369	158.55	157.02
Russia (Ruble) (a)	.0001787	.0001788	5595.00	5594.00
Saudi Arabia (Riyal)	.2666	.2667	3.7503	3.7502
Singapore (Dollar)	.7116	.7124	1.4053	1.4037
Slovak Rep. (Koruna)	.03259	.03259	30.688	30.688
South Africa (Rand)	.2141	.2142	4.6705	4.6690
South Korea (Won)	.001184	.001184	844.75	844.65
Spain (Peseta)	.007546	.007603	132.52	131.53
Sweden (Krona)	.1431	.1435	6.9865	6.9697
Switzerland (Franc)	.7334	.7387	1.3635	1.3537
30-Day Forward	.7357	.7411	1.3593	1.3494
90-Day Forward	.7401	.7454	1.3511	1.3416
180-Day Forward	.7470	.7523	1.3386	1.3293
Taiwan (Dollar)	.03638	.03637	27.489	27.493
Thailand (Baht)	.03902	.03906	25.625	25.605
Turkey (Lira)	.00000911	.00000915	109755.00	109235.00
United Arab (Dirham)	.2723	.2723	3.6720	3.6720
Uruguay (New Peso)	.....	.....	.....	.....
Financial	.1145	.1145	8.7300	8.7300
Venezuela (Bolivar)	.002098	.002096	476.70	477.12
SDR	1.4315	1.4326	.6986	.6980
ECU	1.2308	1.2404	.....	.....

Special Drawing Rights (SDR) are based on exchange rates for the U.S., German, British, French, and Japanese currencies. Source: International Monetary Fund.

European Currency Unit (ECU) is based on a basket of community currencies.

a-fixing, Moscow Interbank Currency Exchange.

The *direct* quote for British pound is:
£1 = \$1.688

Spot Rate Quotations

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Wednesday, January 8, 1997

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The indirect quote for British pound is:
£.5924 = \$1

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4/4

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Spain (Peseta)	.007546	.007603	132.52	131.53
Sweden (Krona)	.1431	.1435	6.9865	6.9697
Switzerland (Franc)	.7334	.7387	1.3635	1.3537
30-Day Forward	.7357	.7411	1.3593	1.3494
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Note that the direct quote is the reciprocal of the indirect quote:

$$1.688 = \frac{1}{.5924}$$

The Bid-Ask Spread

- **The bid price** is the price a dealer is willing to pay you for something.
- **The ask price** is the amount the dealer wants you to pay for the thing.
- **The bid-ask spread** is the difference between the bid and ask prices.

Cross Rates

Suppose that EUR/USD = 0,9914

- 1 EUR = 0,9914 USD

and that USD/JPY = 117,17

- 1 USD = 117,17 JPY

What must the EUR/JPY cross rate be?

$$\frac{\text{EUR}}{\text{JPY}} = \frac{\text{EUR}}{\text{USD}} * \frac{\text{USD}}{\text{JPY}}$$

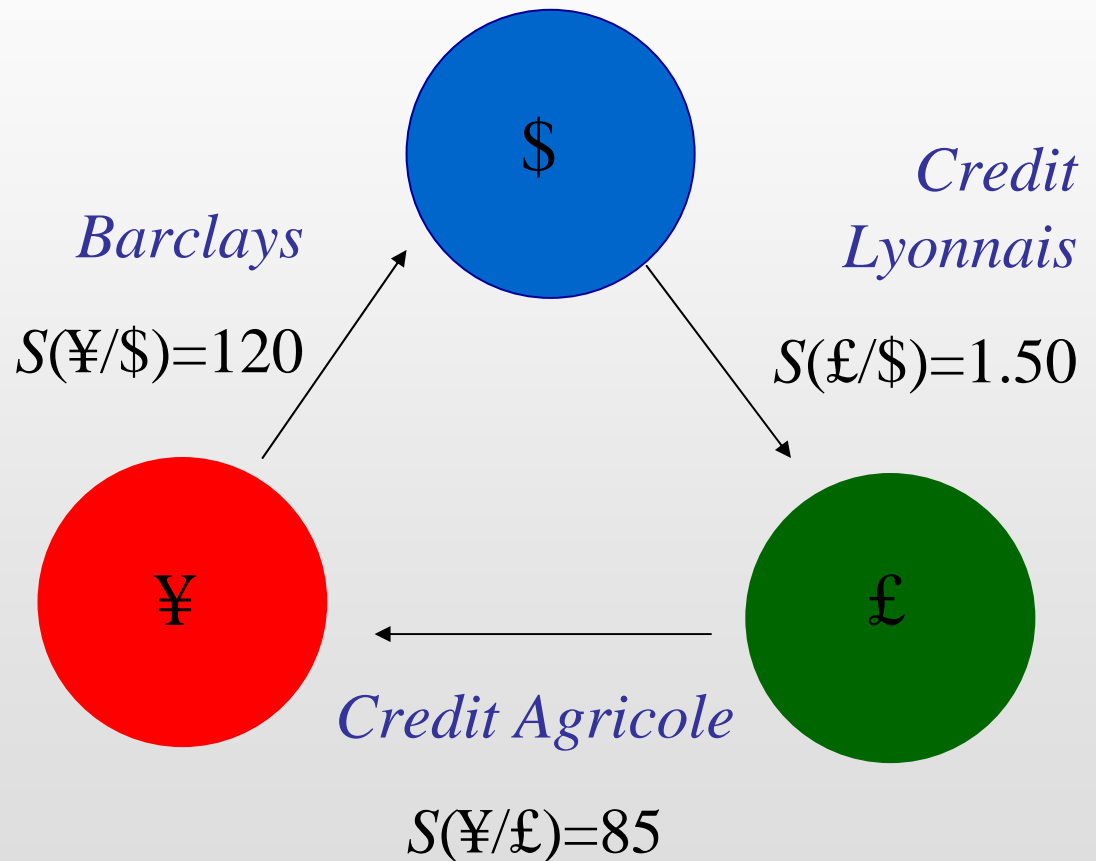
$$\text{EUR/JPY} = 0,9914 * 117,17$$

$$\text{EUR/JPY} = \underline{\underline{116,16}}$$

Triangular Arbitrage

1/4

Suppose we observe these banks posting these exchange rates.



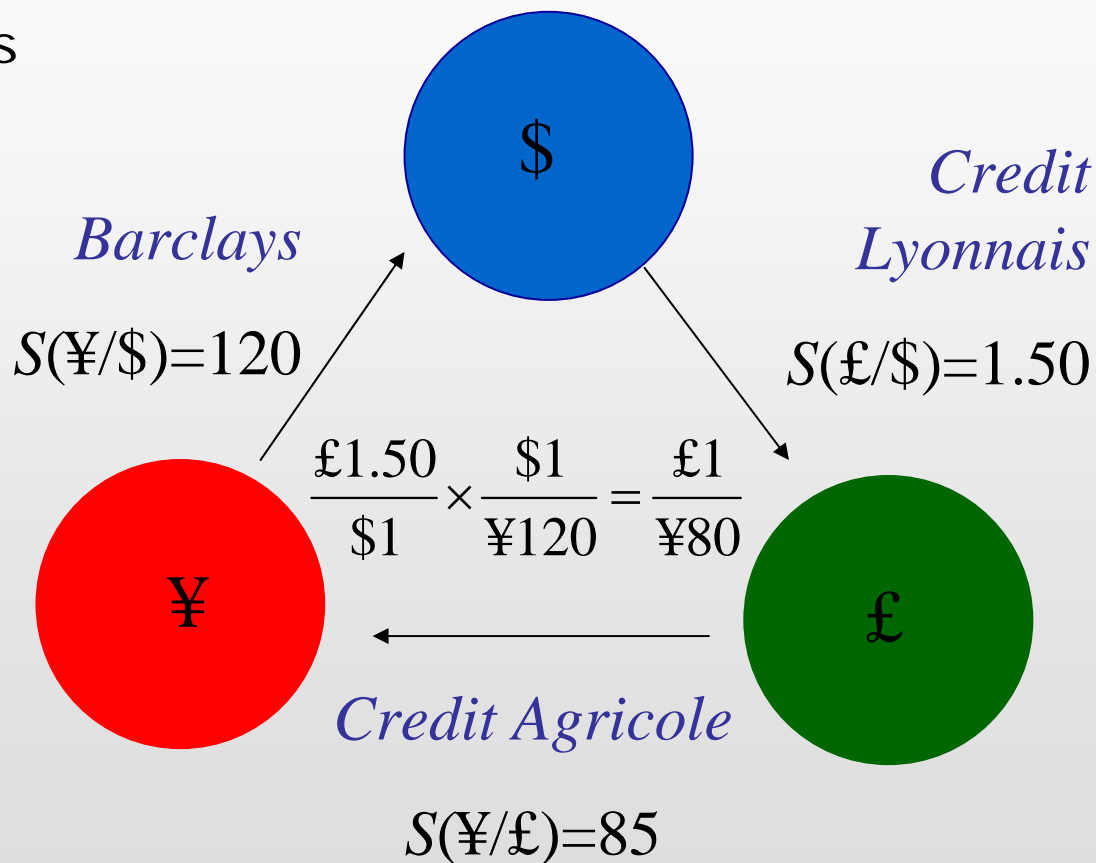
First **calculate** the implied **cross rates** to see if an **arbitrage exists**.

Triangular Arbitrage

2/4

The implied $S(\text{¥}/\text{£})$ cross rate is $S(\text{¥}/\text{£}) = 80$

Credit Agricole has posted a quote of $S(\text{¥}/\text{£}) = 85$ so there is an arbitrage opportunity.



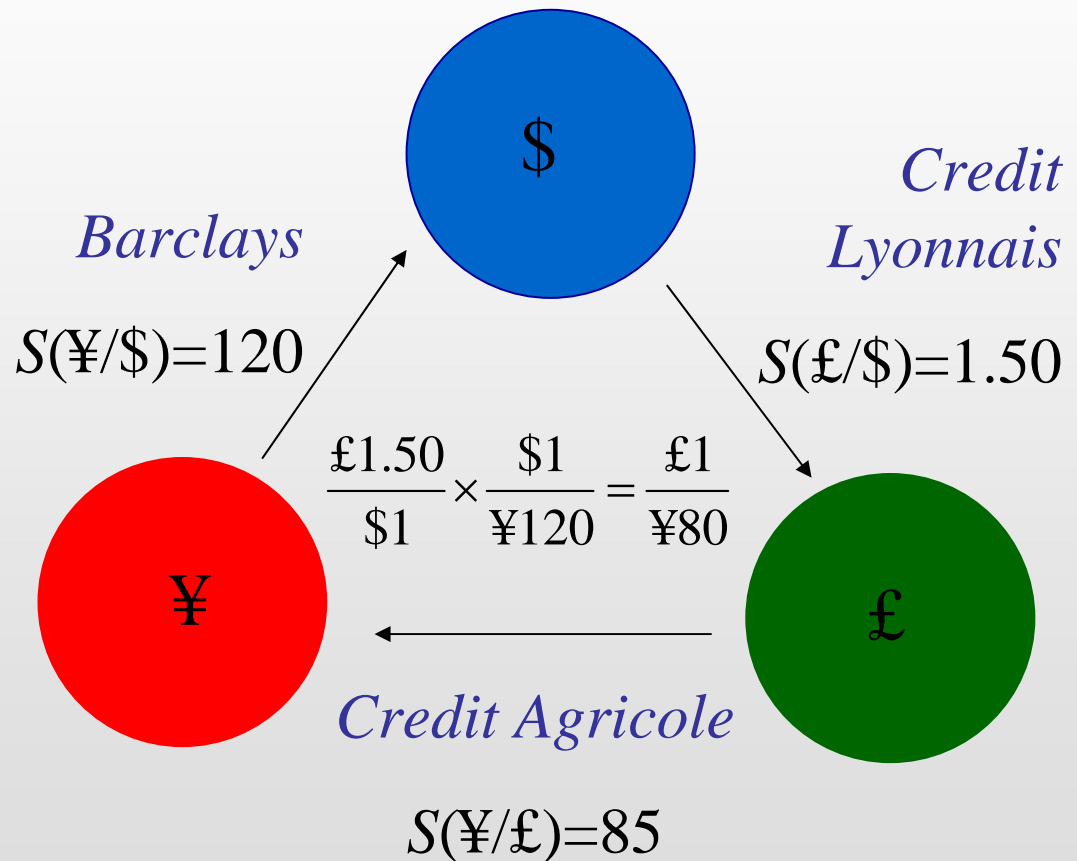
So, how can we make money?

Triangular Arbitrage

3/4

As easy as 1 – 2 – 3:

1. Sell our \$ for £,
2. Sell our £ for ¥,
3. Sell those ¥ for \$.



Triangular Arbitrage

4/4

Sell \$100,000 for £ at $S(£/\$) = 1.50$

receive £150,000

Sell our £ 150,000 for ¥ at $S(¥/£) = 85$

receive ¥12,750,000

Sell ¥ 12,750,000 for \$ at $S(¥/\$) = 120$

receive \$106,250

profit per round trip = \$ 106,250 - \$100,000 = \$6,250

Forward Rate Quotations

1/2

- ❑ A forward contract is an agreement to buy or sell an asset in the future at prices agreed upon today.
- ❑ The forward market for FOREX involves agreements to buy and sell foreign currencies in the future at prices agreed upon today.
- ❑ Bank quotes for 1, 3, 6, 9, and 12 month maturities are readily available for forward contracts.
- ❑ **Consider the example:**
for Japanese yen, the spot rate is
 $¥115.75 = \$1.00$
While the 180-day forward rate is
 $¥ 112.80 = \$1.00$
- ❑ **What's up with that?**

Forward Rate Quotations

2/2

Wednesday, January 8, 1997

EXCHANGE RATES

The New York foreign exchange selling rates below apply to trading among banks in amounts of \$1 million and more, as quoted at 4 p.m. Eastern time by Dow Jones Telerate Inc. and other sources. Retail transactions provide fewer units of foreign currency per dollar.

Country	U.S. \$ equiv.		Currency per U.S. \$	
	Wed.	Tues.	Wed.	Tues.
Argentina (Peso)	1.0012	1.0012	.9988	.9988
Australia (Dollar)	.7805	.7902	1.2812	1.2655
Austria (Schilling)	.09043	.09101	11.058	10.988
Bahrain (Dinar)	2.6525	2.6525	.3770	.3770
Belgium (Franc)	.03080	.03105	32.470	32.205
Brazil (Real)	.9607	.9615	1.0409	1.0401
Britain (Pound)	1.6880	1.6946	.5924	.5901
30-Day Forward	1.6869	1.6935	.5928	.5905
90-Day Forward	1.6843	1.6910	.5937	.5914
180-Day Forward	1.6802	1.6867	.5952	.5929
Canada (Dollar)	.7399	.7370	1.3516	1.3568
30-Day Forward	.7414	.7386	1.3488	1.3539
90-Day Forward	.7442	.7413	1.3437	1.3489
180-Day Forward	.7479	.7450	1.3370	1.3422
Chile (Peso)	.002352	.002356	425.25	424.40
China (Renminbi)	.1201	.1201	8.3272	8.3276
Colombia (Peso)	.0009985	.0009985	1001.50	1001.50
Czech. Rep (Krouna)	.....	.....	.....	.....
Commercial rate	.03662	.03677	27.307	27.194
Denmark (Krone)	.1663	.1677	6.0118	5.9633
Ecuador (Sucre)	.....	.....	.....	.....
Floating rate	.0002766	.0002787	3615.00	3587.50
Finland (Markka)	.2121	.2135	4.7150	4.6841
France (Franc)	.1879	.1893	5.3220	5.2838
30-Day Forward	.1882	.1896	5.3126	5.2741
90-Day Forward	.1889	.1903	5.2935	5.2558
180-Day Forward	.1901	.1914	5.2617	5.2243
Germany (Mark)	.6352	.6394	1.5744	1.5639
30-Day Forward	.6364	.6407	1.5714	1.5607
90-Day Forward	.6389	.6432	1.5652	1.5547
180-Day Forward	.6430	.6472	1.5552	1.5450
Greece (Drachma)	.004049	.004068	246.98	245.80
Hong Kong (Dollar)	.1292	.1292	7.7390	7.7390
Hungary (Forint)	.006139	.006164	162.89	162.23
India (Rupee)	.02787	.02786	35.875	35.890
Indonesia (Rupiah)	.0004233	.0004233	2362.15	2362.63
Ireland (Punt)	1.6664	1.6714	.6001	.5983
Israel (Shekel)	.3079	.3085	3.2474	3.2412
Italy (Lira)	.0006483	.0006510	1542.50	1536.00

Country	U.S. \$ equiv.		Currency per U.S. \$	
	Wed.	Tues.	Wed.	Tues.
Japan (Yen)	.008639	.008681	115.75	115.20
30-Day Forward	.008676	.008718	115.26	114.71
90-Day Forward	.008750	.008791	114.26	113.76
180-Day Forward	.008865	.008907	112.80	112.28
Jordan (Dinar)	1.4075	1.4075	.7105	.7105
Kuwait (Dinar)	3.3367	3.3389	.2997	.2995
Lebanon (Pound)	.0006445	.0006445	1551.50	1551.50
Malaysia (Ringgit)	.4018	.4002	2.4885	2.4990
Malta (Lira)	2.7624	2.7701	.3620	.3610
Mexico (Peso)	.....	.....	.....	.....
Floating rate	.1278	.1277	7.8220	7.8330
Netherland (Guilder)	.5655	.5699	1.7685	1.7547
New Zealand (Dollar)	.7072	.7106	1.4140	1.4073
Norway (Krone)	.1540	.1548	6.4926	6.4599
Pakistan (Rupee)	.02529	.02529	39.540	39.540
Peru (new Sol)	.3814	.3840	2.6218	2.6039
Philippines (Peso)	.03800	.03802	26.318	26.300
Poland (Zloty)	.3460	.3475	2.8900	2.8780
Portugal (Escudo)	.006307	.006369	158.55	157.02
Russia (Ruble) (a)	.0001787	.0001788	5595.00	5594.00
Saudi Arabia (Riyal)	.2666	.2667	3.7503	3.7502
Singapore (Dollar)	.7116	.7124	1.4053	1.4037
Slovak Rep. (Koruna)	.03259	.03259	30.688	30.688
South Africa (Rand)	.2141	.2142	4.6705	4.6690
South Korea (Won)	.001184	.001184	844.75	844.65
Spain (Peseta)	.007546	.007603	132.52	131.53
Sweden (Krona)	.1431	.1435	6.9865	6.9697
Switzerland (Franc)	.7334	.7387	1.3635	1.3537
30-Day Forward	.7357	.7411	1.3593	1.3494
90-Day Forward	.7401	.7454	1.3511	1.3416
180-Day Forward	.7470	.7523	1.3386	1.3293
Taiwan (Dollar)	.03638	.03637	27.489	27.493
Thailand (Baht)	.03902	.03906	25.625	25.605
Turkey (Lira)	.00000911	.00000915	109755.00	109235.00
United Arab (Dirham)	.2723	.2723	3.6720	3.6720
Uruguay (New Peso)	.....	.....	.....	.....
Financial	.1145	.1145	8.7300	8.7300
Venezuela (Bolivar)	.002098	.002096	476.70	477.12
SDR	1.4315	1.4326	.6986	.6980
ECU	1.2308	1.2404	.....	.....

Special Drawing Rights (SDR) are based on exchange rates for the U.S., German, British, French, and Japanese currencies. Source: International Monetary Fund.

European Currency Unit (ECU) is based on a basket of community currencies.

a-fixing, Moscow Interbank Currency Exchange.

Clearly the market participants expect that the yen will be worth MORE in dollars in six months.

Long and Short Forward Positions

- ❑ If you have agreed to **s**ell anything (spot or forward), you are “**s**hort”.
- ❑ If you have agreed to buy anything (forward or spot), you are “long”.
- ❑ If you have agreed to sell forex forward, you are short.
- ❑ If you have agreed to buy forex forward, you are long.

Thank you for your attention!