

Lesson I: Overview

1. International financial markets
2. Foreign exchange markets



International Financial Markets

Getting started

All finance has become more and more “international”



Growing importance due to both

1. International trade
2. Foreign investments

International trade I

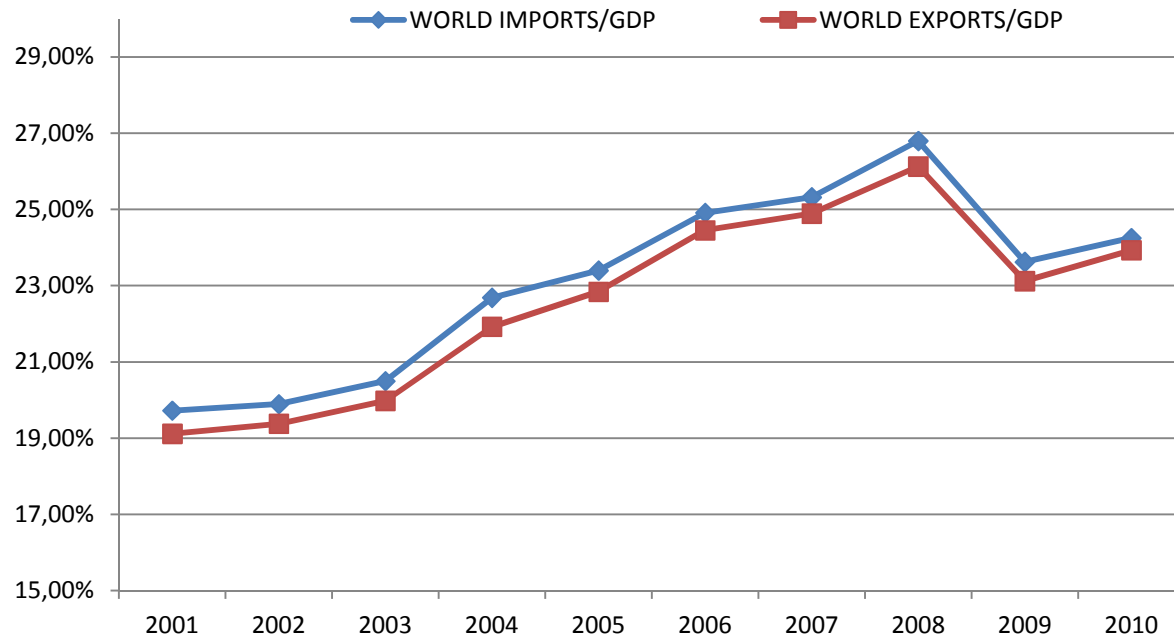
Amazing growth of international trade flows all over the last decades



Twofold reason:

1. Liberalization of trade (tariffs, quotas..)
2. Improvements in communication and transportation technologies → thinner economic space

International trade II



Sources: IMF and International Trade Center

International trade III

Rewards & Risks

1. Enhanced comparative and competitive advantages;
2. Developments of related “industrial clusters”;
3. Uncertainty about the exchange rate (FX risk);
4. Operating and Country risk;

Terminology I



Comparative advantage: relative efficiency (lower opportunity cost) in producing something → static production efficiency

Competitive advantage: the edge a country enjoys from dynamic factors affecting international competitiveness → dynamic factors such as the existence of supportive industries, experienced management...

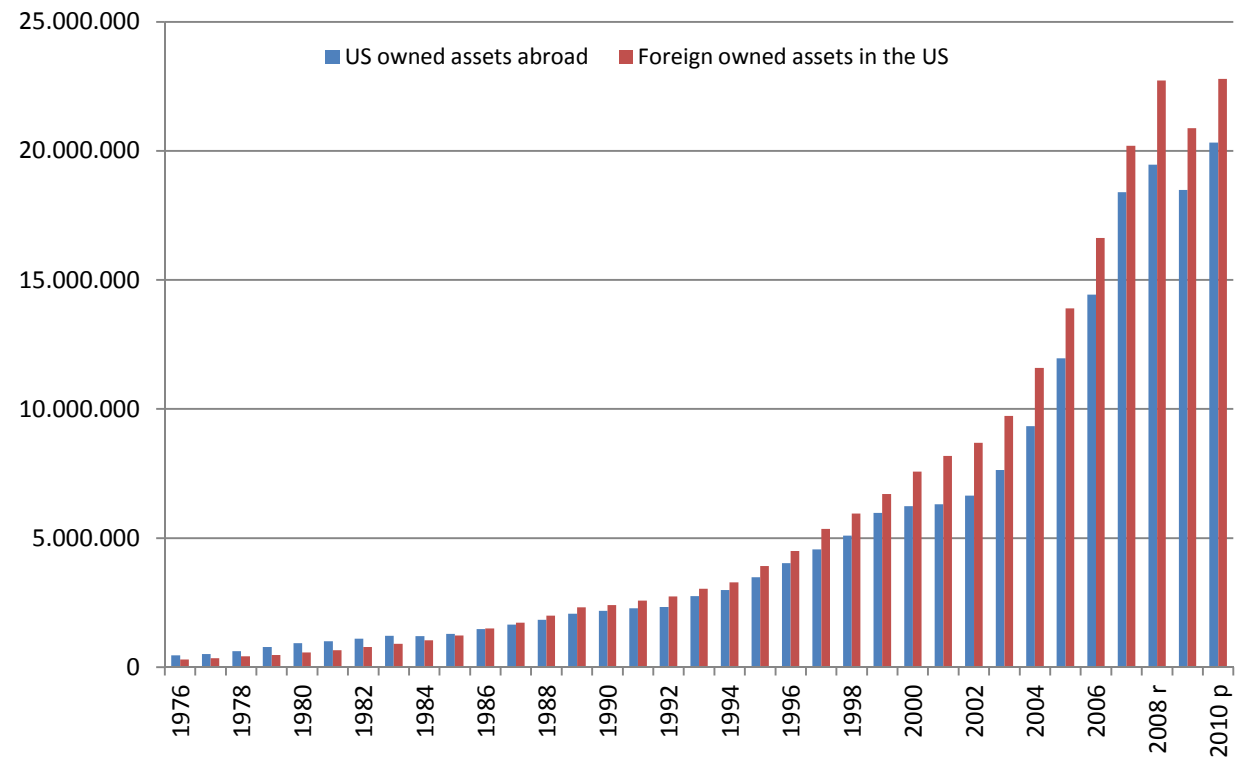
Terminology II



Tariffs (excise taxes): taxes on imports, generally based on value (ad valorem) or on weight.

Quotas: restrictions on the quantity of a good that can be imported.

Foreign Investments I



Source: US Bureau of Economic Analysis, millions of USD

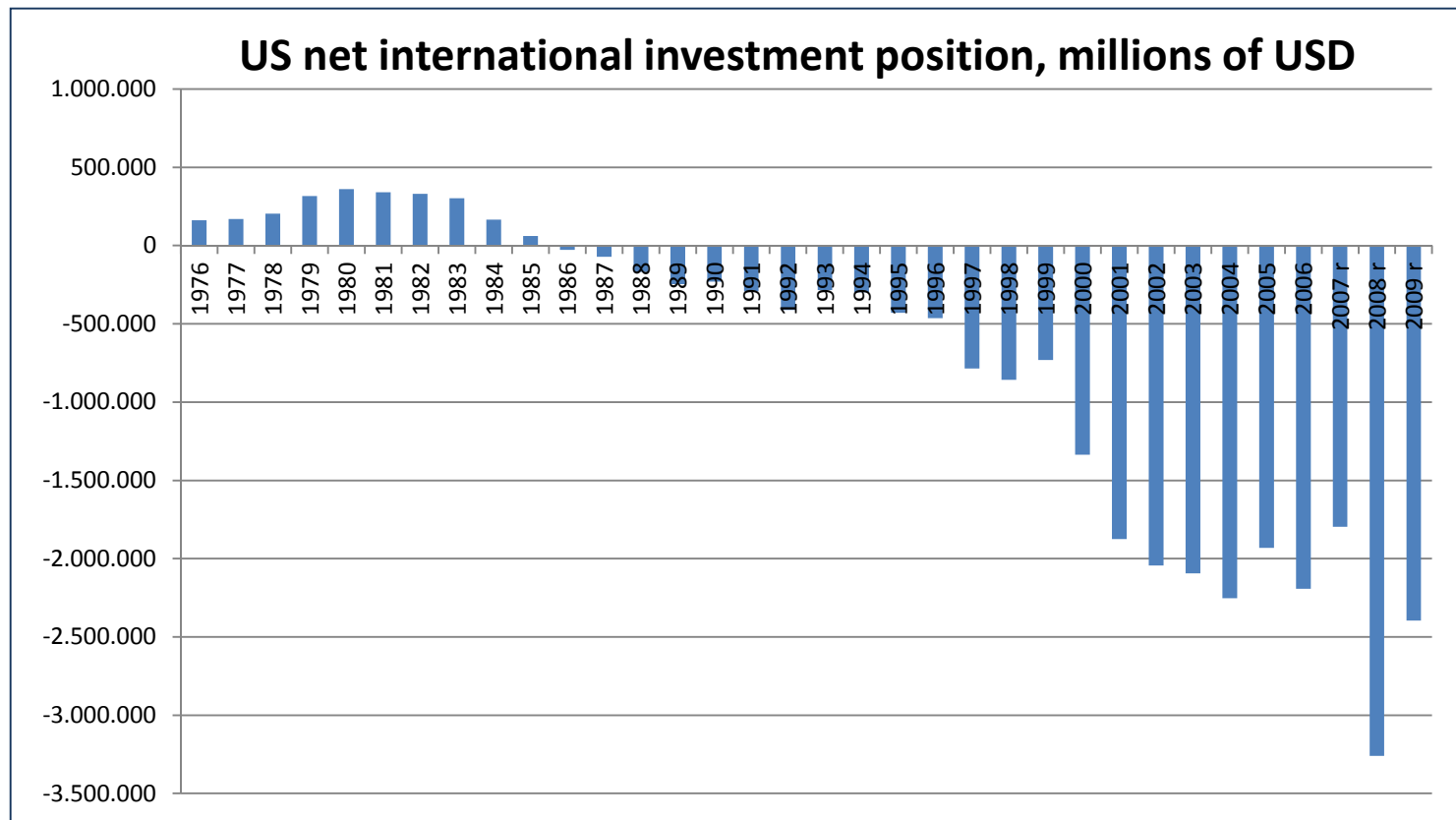
Foreign Investments II

Increased globalization of investments



Some countries have gone from being net creditors to net debtors

Foreign Investments III



Foreign investments IV

Rewards & Risks

1. Improved efficiency in the global allocation of capitals;
2. Enhanced diversification;
3. Exchange rate risk;
4. Operating and Country risk;

The link between financial and foreign exchange markets

The international flows of goods and capitals are the source of supply and demand for currencies

Foreign Exchange Markets

Spot foreign exchange markets

- Spot → for immediate delivery (settlement in T+1 or T+2)
- Mainly decentralized → no precise physical location (24h trading)
- The market operates both



Directly (interbank)



Indirectly (brokers)

Interbank market I

All participating banks act as Market Makers
→ banks quote buying and selling prices to each other (bank A can call bank B for a quote on a certain currency and bank B, in turn, makes a market by providing bid and ask prices upon demand)

Interbank market II

Decentralized, continuous, open-bid, double-auction:

- ✓ **Decentralized** = no central physical location
- ✓ **Continuous** = quotations of prices are continuously available all over the trading day
- ✓ **Open** = market participants must quote both buying and selling prices (bid/ask quotations), so that the buy or sell intention and the corresponding amount need not to be specified when a bank calls another market maker

Interbank market III

- ✓ **Double-auction** = market participants on both sides of a transaction could be either buyers or sellers, so that banks can call each other for price quotations.

FX brokers I

FX Broker: agent who helps arrange the trading of currencies between market participants by matching buying and selling orders.



A broker does not deal for his own portfolio, but mainly tries to facilitate transactions between third parties.

FX brokers II

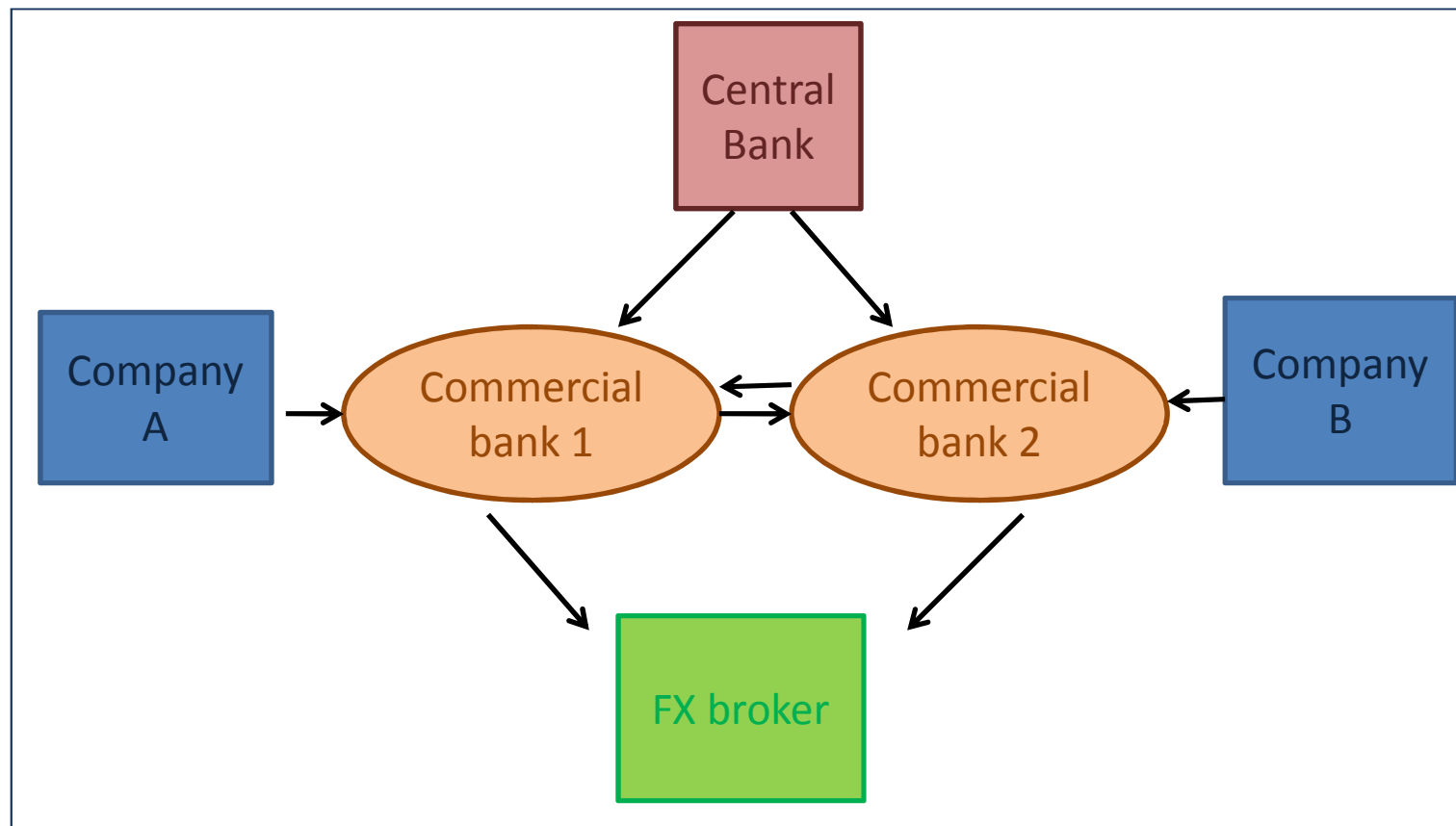
Quasi-centralized, continuous, limit-book, single-auction market:

- ✓ **Quasi-centralized** = a broker puts all the orders on his book and tries to match buying and selling proposals: basically, brokers in different locations help facilitate transactions
- ✓ **Continuous** = all over the trading day
- ✓ **Limit-book** = orders placed with a broker are “limit orders”

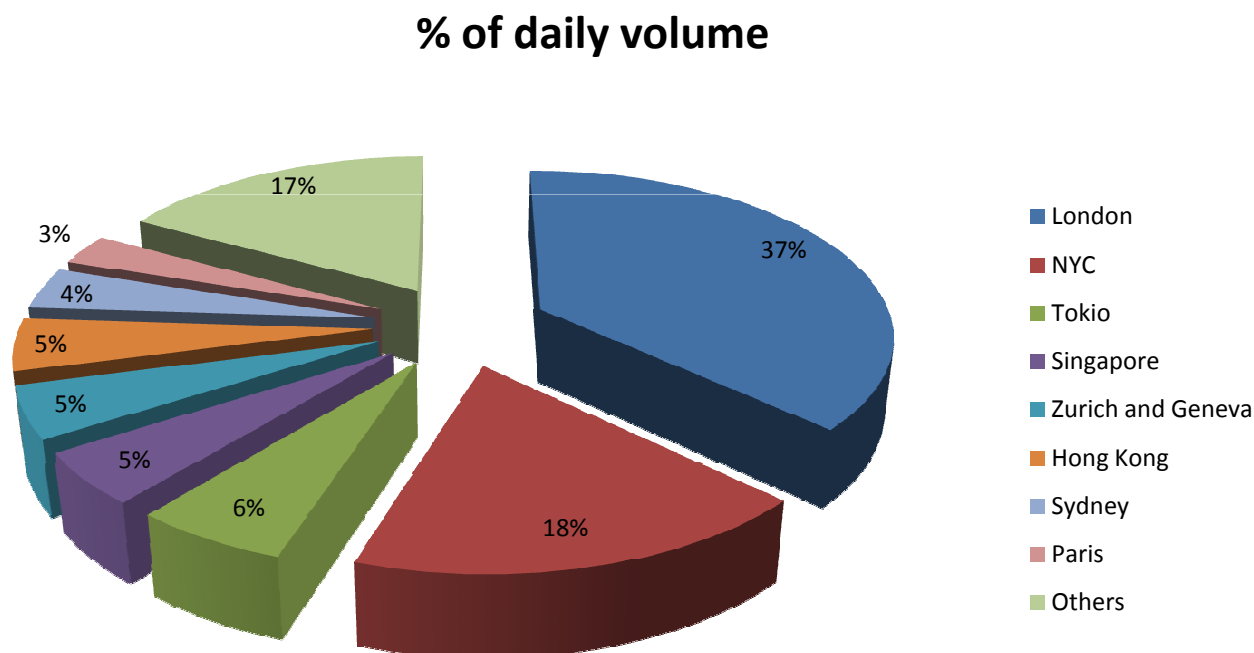
FX brokers II

- ✓ **Single-auction** = the agent being approached, but not the person making the approach, quotes buying and selling prices

Organization of FX mkt



Daily volume of FX trading by location in 2010



Source: <http://countingpips.com>

Daily volume of FX trading by location in 2010



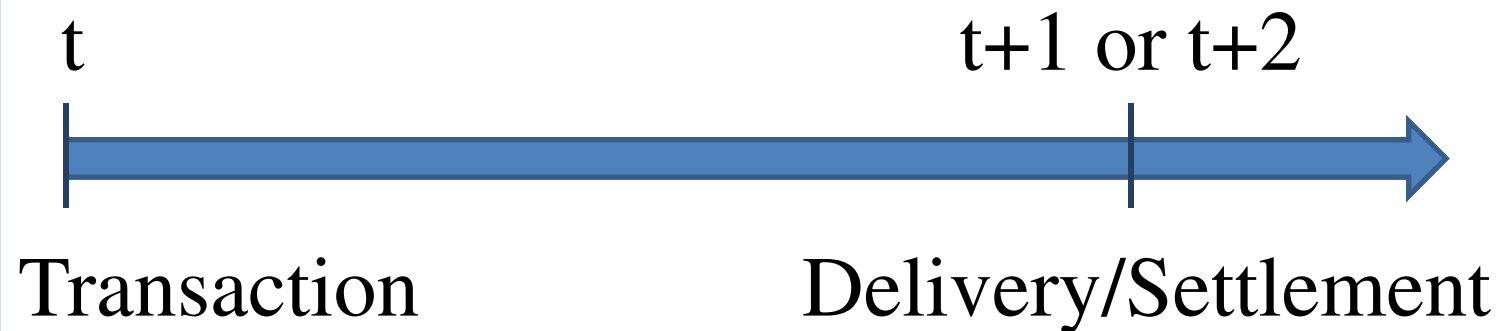
FX mkt vs Regulated mkts

FX mkt	Regulated Mkts
Geographically dispersed	Centralized
Broker/Dealer	Electronic Trading/ Open Outcry
24h	Well-defined trading hours
Customized	Standardized
Price dispersion	Price concentration

Source: R. Levich, 2007

Settlement I

Spot transactions carried out today are to be regulated in 1 or 2 business days, when the buyer that has purchased foreign currency will have to pay the seller.



Settlement II

The settlement generally takes place via a Clearing House



Clearing House: institution at which banks keep funds which can be moved from one bank's account to another to settle interbank transactions.

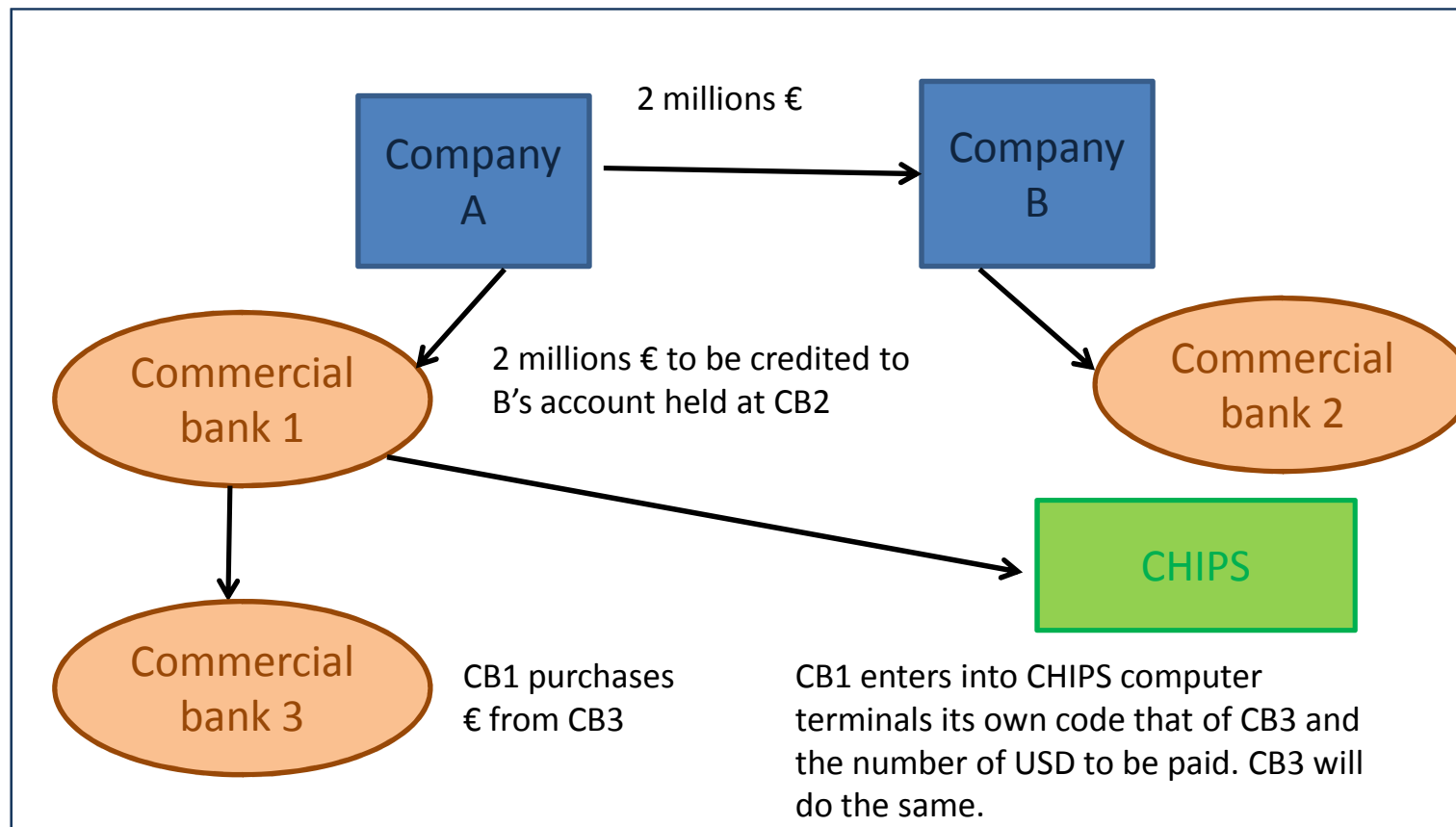
Settlement III

When FX transactions involve settlement in USD, the longer established clearing house is the so-called “CHIPS” (Clearing House Interbank Payments System)

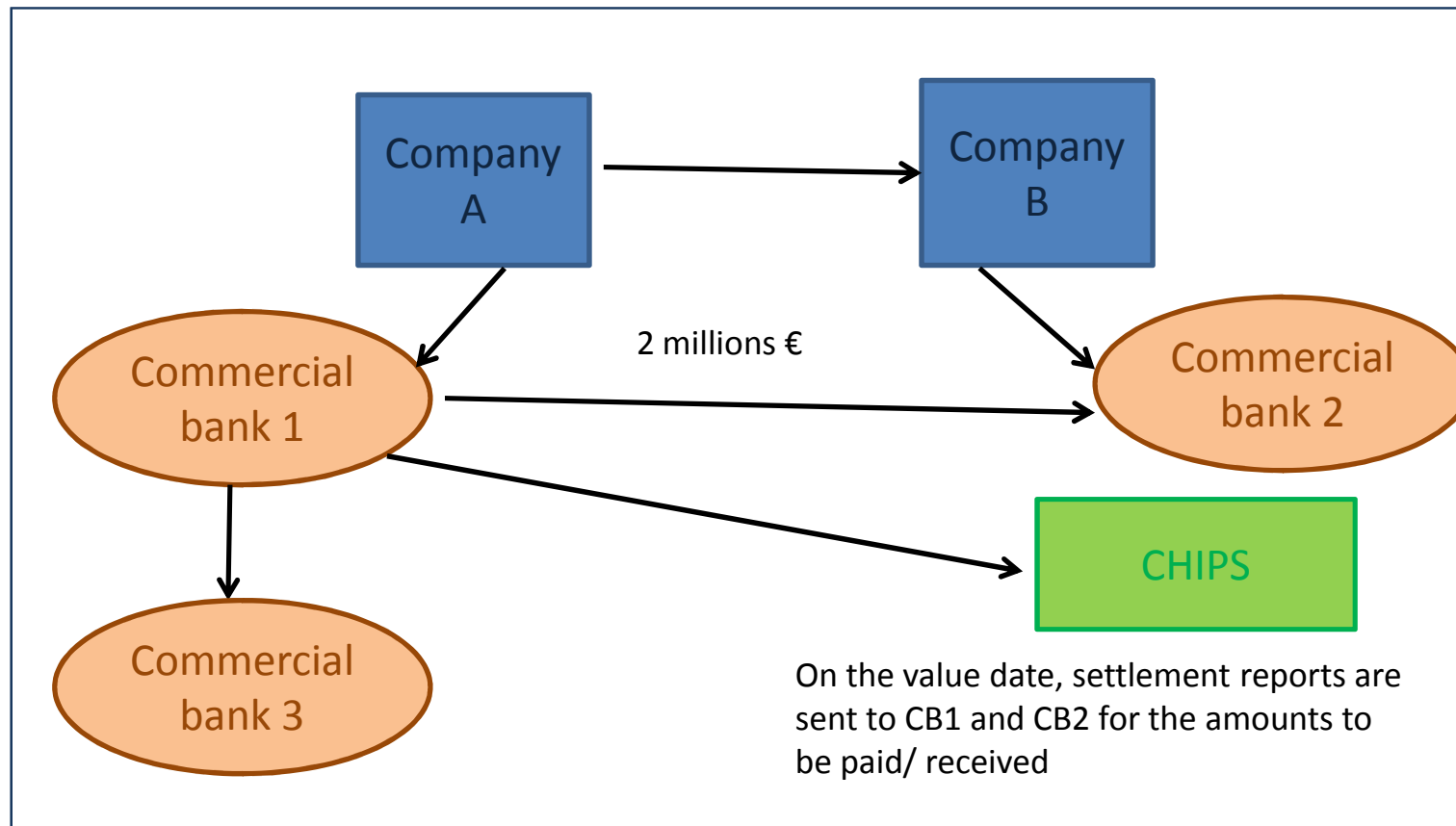


CHIPS is a computerized mechanism through which member banks hold USD accounts to pay each other when buying or selling FX

Settlement IV



Settlement V



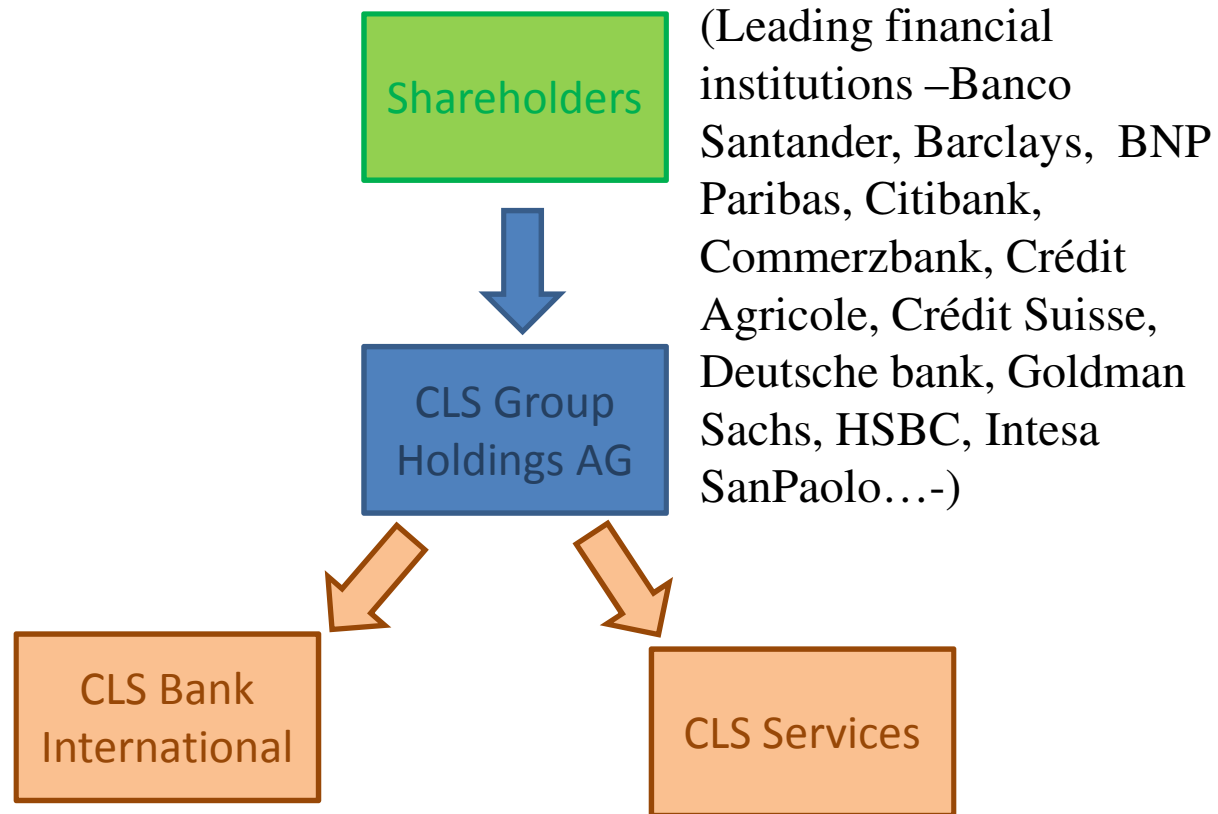
Settlement VI

An alternative system has been available since 2002: the CLS (Continuous Linked Settlement)

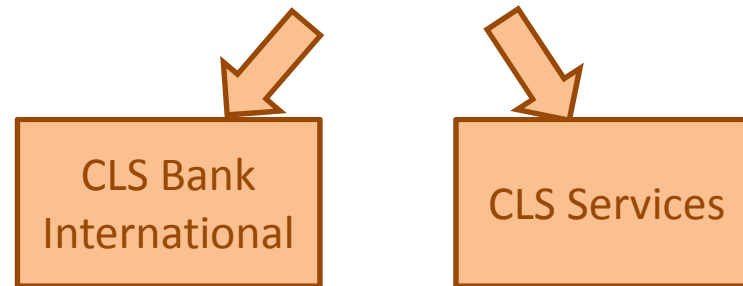


CLS should reduce the settlement risk, provided that a **continuous** system prevents all situations where a bank pays for a currency before receiving it.

CLS I



CLS II



Fed regulated. Established PVP (payment vs payment) system, to minimize settlement risk.

London based. It provides technical support to CLS bank.

CLS III

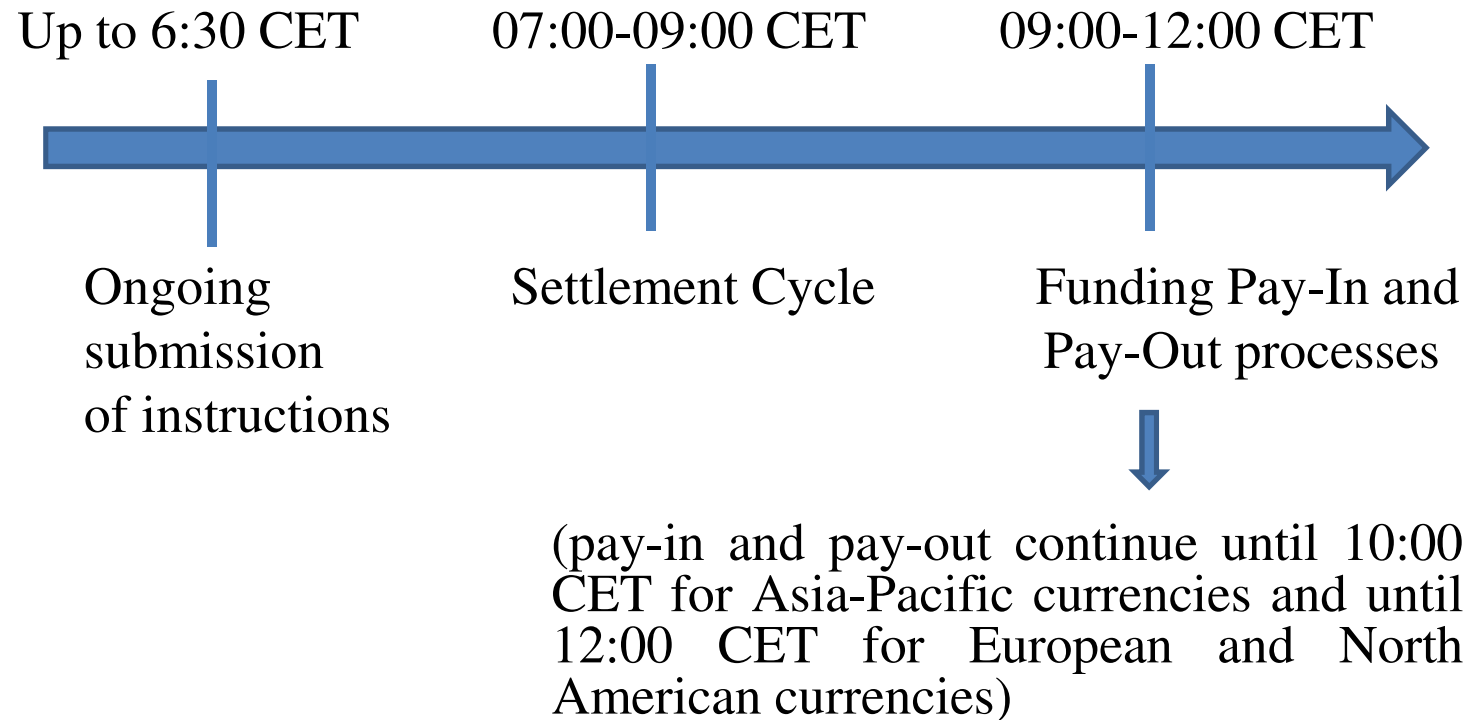
Settlement Members: “Membership in CLS Bank is generally limited to shareholders and their affiliates. Central banks are eligible to become CLS Members without owning shares”.

[...] “Each Settlement Member has a single multi-currency account with CLS Bank. Settlement Members may submit payment instructions relating to their own FX transactions as well as the FX transactions of their customers directly to CLS”.

Source: www.cls-group.com

CLS IV

Bank operational timeline



CLS V

- 1. Submit instructions:** Instructions can be submitted up to 06:30 CET for each settlement date. At 06:30 CET each settlement member receives its final net pay-in schedule for the day;
- 2. Funding and Settlement:** settlement members pay in net funds based on the 06:30 CET schedule to the CLS bank account at the relevant Central Bank. Funding and settlement process begins at 07:00 CET

CLS VI

3. Execution: between 07:00 and 09:00 CET, CLS bank continuously receives funds from the settlement members, settles instructions across its books and pays out funds to settlement members until settlement is complete. Instructions that cannot immediately settle remain on the queue and are continually revisited.

Delving with exchange rates I

The *Exchange rate (FX)* is the price of one currency in terms of another. More generally, **$S(i/j)$** is the number of units of currency **i** per unit of currency **j** (watch out: the international convention generally adopts the opposite notation, so that $S(i/j)$ is the number of units of currency j per unit of currency i)



Two major quoting conventions:

- ✓ **Direct quotation**= number of domestic currency per foreign currency unit → D/F currency

- ✓ **Indirect quotation**= number of units of foreign currency per domestic currency → F/D currency

Delving with exchange rates II

Taking the USD as the home currency:

✓ **Direct quotation:** number of USD per foreign currency unit \rightarrow \$/foreign currency



US\$ equivalent terms (€ and £)

✓ **Indirect quotation:** number of units of foreign currency per USD \rightarrow foreign currency/\$



European terms

Delving with exchange rates III

To a close approximation,

$$FX_{USD\text{equivalent}} = \frac{1}{FX_{European\text{terms}}}$$

- USD 1.3797/EUR means that 1 EUR is quoted as 1.3797 USD
- EUR .7248/USD means that 1 USD is quoted as .7248 EUR

- Notice that $1.3797 \approx \frac{1}{.7248}$

Delving with exchange rates IV

- USD 2.0275/GBP means that you will receive 2.0275 USD per unit of GBP, stated in other terms, GBP is quoted as 2.0275 USD
- GBP .4932/USD means that you will receive .4932 GBP per USD, or, equivalently, USD is quoted as .4932 GBP
- Notice that $2.0275 \approx \frac{1}{.4932}$

Delving with exchange rates V

More generally,

$$S_{\text{Currency}_1 / \text{Currency}_2} \cong \frac{1}{S_{\text{Currency}_2 / \text{Currency}_1}}$$



Reciprocal rates

(the foregoing relationship would hold exactly, if there were no transactions costs)

Conventions for spot FX quotations

Currencies London close on Jan 9

	Per euro	In euros	Per U.S. dollar	In U.S. dollars
AMERICAS				
Argentina peso-a	25006	0.1818	43166	0.2317
Brazil real	2.3462	0.4262	1.8412	0.5431
Canada dollar	1.3092	0.7639	1.0274	0.9734
Chile peso	653.79	0.001530	513.06	0.001949
Colombia peso	2395.68	0.0004174	1880.00	0.0005319
Ecuador US dollar-f	1.2743	0.7847	1	1
Mexico peso-a	17.5050	0.0571	13.7370	0.0728
Peru sol	3.4316	0.2914	2.6930	0.3713
Uruguay peso-e	24.972	0.0400	19.597	0.0510
U.S. dollar	1.2743	0.7847	1	1
Venezuela bolivar	5.54	0.180401	4.35	0.229885
ASIA-PACIFIC				
Australia dollar	1.2477	0.8015	0.9792	1.0213
1-mo. forward	1.2525	0.7984	0.9829	1.0174
3-mos. forward	1.2602	0.7935	0.9890	1.0112
6-mos. forward	1.2711	0.7867	0.9975	1.0025
China yuan	8.0484	0.1242	6.3160	0.1583
Hong Kong dollar	9.8968	0.1010	7.7664	0.1288
India rupee	66.7739	0.0150	52.4005	0.0191
Indonesia rupiah	11664	0.0000857	9153	0.0001093
Japan yen	97.98	0.010206	76.89	0.013005
1-mo. forward	97.95	0.010210	76.86	0.013010
3-mos. forward	97.85	0.010220	76.79	0.013023
6-mos. forward	97.68	0.010238	76.65	0.013046
Malaysia ringgit-c	4.0181	0.2489	3.1532	0.3171
New Zealand dollar	1.6234	0.6160	1.2740	0.7849
Pakistan rupee	114.681	0.0087	89.995	0.0111
Philippines peso	56.120	0.0178	44.040	0.0227
Singapore dollar	1.6535	0.6048	1.2975	0.7707
South Korea won	1478.31	0.0006764	1160.10	0.0008620
Taiwan dollar	38.523	0.02596	30.231	0.03308
Thailand baht	40.507	0.02469	31.788	0.03146
EUROPE				
Euro zone euro	1	1	0.7847	1.2743
1-mo. forward	0.9999	1.0001	0.7847	1.2744
3-mos. forward	0.9993	1.0007	0.7842	1.2752
6-mos. forward	0.9982	1.0018	0.7834	1.2765
Czech Rep. koruna-b	25.742	0.0388	20.201	0.0495
Denmark krone	7.4357	0.1345	5.8351	0.1714
Hungary forint	316.04	0.003164	248.01	0.004032
Norway krone	7.6648	0.1305	6.0149	0.1663
Poland zloty	4.4917	0.2226	3.5249	0.2837
Russia ruble-d	40.665	0.02459	31.912	0.03134
Sweden krona	8.8172	0.1134	6.9192	0.1445
Switzerland franc	1.2135	0.8241	0.9523	1.0501
1-mo. forward	1.2130	0.8244	0.9519	1.0506
3-mos. forward	1.2114	0.8255	0.9507	1.0519
6-mos. forward	1.2089	0.8272	0.9487	1.0541
Turkey lira	2.3866	0.4190	1.8729	0.5339
U.K. pound	0.8256	1.2112	0.6479	1.5434
1-mo. forward	0.8259	1.2109	0.6481	1.5430
3-mos. forward	0.8263	1.2102	0.6485	1.5421
6-mos. forward	0.8271	1.2090	0.6491	1.5406
MIDDLE EAST/AFRICA				
Bahrain dinar	0.4803	2.0818	0.3770	2.6529
Egypt pound-a	7.6929	0.1300	6.0370	0.1656
Israel shekel	4.8997	0.2041	3.8450	0.2601
Jordan dinar	0.9041	1.1061	0.7095	1.4095
Kuwait dinar	0.3553	2.8142	0.2789	3.5862
Lebanon pound	1918.39	0.0005213	1505.45	0.0006643
Saudi Arabia riyal	4.7789	0.2093	3.7503	0.2666
South Africa rand	10.4221	0.0959	8.1787	0.1223
United Arab dirham	4.6805	0.2137	3.6730	0.2723

“Indirect quotation” or “European terms”

“Direct quotation” or “\$ equivalent”

Cross Rates I

Cross rate: exchange rate between two currencies, neither of which is the USD

Suppose you want to exchange € for GBP

Direct transaction



Indirect transaction



Cross Rates II

In the absence of transaction costs, it must be that the direct exchange rate (between EUR and GBP) is equal to the exchange rate implicit in indirect exchange via the USD.

$$S_{\text{£}/\text{€}} = S_{\text{\$/€}} * S_{\text{£}/\text{\$}}$$

Cross Rates III

$$S_{\text{£}/\text{€}} = S_{\text{\$/€}} * S_{\text{£}/\text{\$}}$$

- $S_{\text{£}/\text{€}}$ = number of GBP received per EUR
- $S_{\text{\$/€}}$ = number of USD received per EUR
- $S_{\text{£}/\text{\$}}$ = number of GBP received per USD

TRIANGULAR PARITY

(equilibrium relation among any 3 currencies)

Cross Rates IV

Cross Currency Rates

XDF<GO> to set default pricing source

2) Currency Group - Key Cross Currency Rates - Majors

01/04/12 Rate Spot Monitor Last Price Source BGN Bloomberg BGN(NY)

	USD	EUR	JPY	GBP	CHF	CAD	AUD	NZD	HKD	NOK	SEK
SEK	6.8627	8.8938	.08946	10.711	7.2945	6.7691	7.0898	5.4040	.88339	1.1548	-
NOK	5.9428	7.7017	.07747	9.2756	6.3168	5.8618	6.1395	4.6797	.76498	-	.86596
HKD	7.7686	10.068	.10127	12.125	8.2575	7.6627	8.0257	6.1174	-	1.3072	1.1320
NZD	1.2699	1.6458	.01655	1.9821	1.3498	1.2526	1.3119	-	.16347	.21369	.18505
AUD	.96797	1.2544	.01262	1.5108	1.0289	.95477	-	.76223	.12460	.16288	.14105
CAD	1.0138	1.3139	.01322	1.5824	1.0776	-	1.0474	.79834	.13050	.17060	.14773
CHF	.94080	1.2192	.01226	1.4684	-	.92797	.97193	.74083	.12110	.15831	.13709
GBP	.64069		.00835	-	.68101	.63196	.66189	.50451	.08247	.10781	.09336
JPY	76.712		-	119.73	81.540	75.666	79.250	60.407	9.8746	12.908	11.178
EUR	.77163	-	.01006	1.2044	.82019	.76111	.79716	.60762	.09933	.12984	.11244
USD	-	1.2960	.01304	1.5608	1.0629	.98636	1.0331	.78745	.12872	.16827	.14572

Color
Increased Unchanged Decreased

Rates are from Composite where Bloomberg BGN is not available

Source: Bloomberg, 4th January 2012

Cross Rates V



Assuming no transaction costs

If JPY 76.712/USD and USD 1.2960/EUR, what should be $S_{\text{JPY/EUR}}$ to prevent all arbitrage opportunities?

$$S_{\text{JPY/EUR}} = 76.712 * 1.2960 = 99.42$$

Cross Rates VI



Assuming no transaction costs

If USD 1.2960/EUR and USD 1.5608/GBP, what should be $S_{\text{GBP/EUR}}$ to avoid all arbitrage opportunities?

$$S_{\text{GBP/EUR}} = 1.2960 / 1.5608 = .83$$

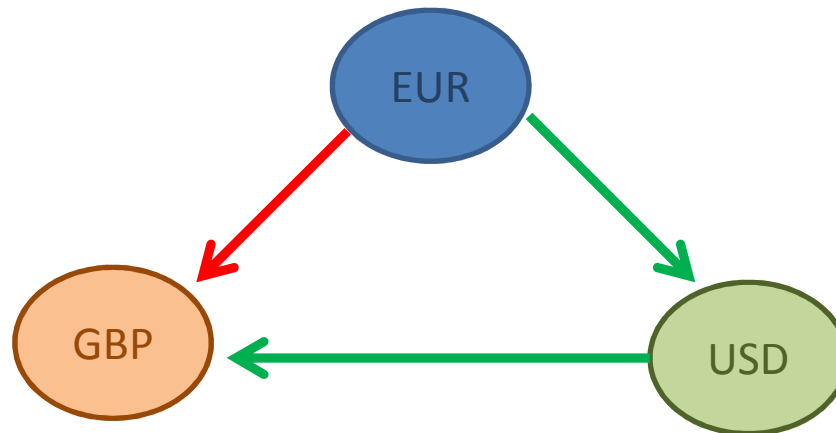
Cross Rates VII

Deviations from triangular parity may give rise to arbitrage opportunities: **TRIANGULAR ARBITRAGES**



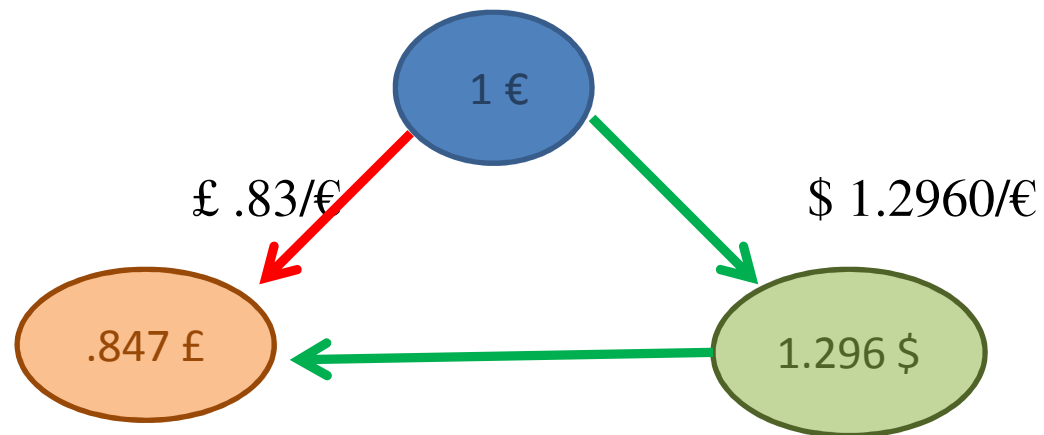
In an arbitrage, you buy low, you sell high and you earn a risk-free profit

Cross Rates VIII



The red and the green arrows must yield the same (i.e. you must get the same amount of £), otherwise there would be riskless profit opportunities.

Cross Rates IX



\$1.53/£ (instead of \$1.5608/£)

If you chose the indirect transaction, you would end up with .847£ instead of .83£ (resulting from the direct transaction), thus cashing in a risk-free profit equal to $.847 - .83 = .017£$

Terminology I



- **Arbitrageur:** market player that buys or sells something in order to exploit a price differential so as to make a riskless profit;
- **Speculator:** market player that holds (sells) goods or securities in the hope of profiting from a future rise (fall) in their price (risky profit)

Terminology II

- *One-way arbitrage*: the process of choosing the best way to exchange one currency for another → you start with a certain currency and you end up with a different one (e.g. you exchange EUR to USD);

Terminology III

• *Round-trip arbitrage*: Borrowing in one currency, lending in another, and then selling the second currency back into the first so as to end up back in the first currency → you start with a certain currency and you end up with the very same one (e.g. from EUR to EUR)



Triangular arbitrages are round-trip transactions

Terminology IV

Suppose that there is a sudden change in the \$/£:

- Change from \$ 1.75/£ to \$ 1.50/£:
Appreciation of \$ against £/
Depreciation of £ against \$
- Change from \$ 1.75/£ to \$ 1.95/£:
Appreciation of £ against \$/
Depreciation of \$ against £

Terminology V



- **Appreciation/ Depreciation:** increase/ decrease in the foreign exchange value of a currency when exchange rates are free to move (flexible) → mkt driven
- **Revaluation/ Devaluation :** increase/decline in the foreign exchange value of a currency on fixed exchange rates. It occurs when the parity rate is set at a higher/lower level → CB driven

To put it into practice

Fill in the blanks by finding the appropriate cross-rates

	Currency5	Currency4	Currency3	Currency2	Currency1
Currency1	1.53			.08	---
Currency2			27.47	---	
Currency3	7.28		---		
Currency4		---			
Currency5	---	.154			