



Spot Markets

P. Sercu,
*International
Finance: Theory into
Practice*

Overview

Part II

The Currency Market and its Satellites



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Chapter 3

Spot Markets for Foreign Exchange



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Our Convention: HC units per unit of FC

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What have we learned?

- ◇ **Our quoting convention:** the price, in units of home currency (HC), per unit of foreign currency (FC)—or HC/FC—like we do for bread or umbrellas.

Example

- ▷ “USD/EUR 1.25” is an American’s natural quote for the EUR. Under our convention, Eurolanders would quote EUR/USD 0.80.
- ▷ “USD/CAD 0.8333” is an American’s natural quote for the CAD, since the CAD is the currency in the denominator, the one the price is expressed in.

◇ Semantics

- ▷ called “right”, “direct” quote; US: “US terms”
- ▷ denoted in the text as e.g. $S_t = \text{CAD/USD } 1.25$ where CAD/USD is the *dimension*
- ▷ pro’s use the inverse of the dimension as the *symbol*:

“USDCAD or USD/CAD = 1.20” (dimension: CAD/USD)

“value of USD in CAD”



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Symbols v dimensions: examples



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Symbol	Currency Pair	dimension	Trading Terminology
USDJPY	US Dollar, in Japanese Yen	JPY/USD	Dollar Yen
USDCHF	US Dollar, in Swiss Franc	CHF/USD	Dollar Swiss, or Swissy
USDCAD	US Dollar, in Canadian Dollar	CAD/USD	Dollar Canada
USDZAR	US Dollar, in South African Rand	ZAR/USD	Dollar Zar or South African Rand
GBPUSD	British Pound, in US Dollar	USD/GBP	Cable
GBPCHF*	British Pound, in Swiss Franc	CHF/GBP	Sterling Swiss
GBPJPY*	British Pound, in Japanese Yen	JPY/GBP	Sterling Yen
AUDUSD	Australian Dollar, in US Dollar	USD/AUD	Aussie Dollar
NZDUSD	New Zealand Dollar, in US Dollar	USD/NZD	New Zealand Dollar or Kiwi
EURUSD	Euro, in US Dollar	USD/EUR	Euro
EURGBP*	Euro, in British Pound	GBP/EUR	Euro Sterling
EURJPY*	Euro, in Japanese Yen	JPY/EUR	Euro Yen
EURCHF*	Euro, in Swiss Franc	CHF/EUR	Euro Swiss
CHFJPY*	Swiss Franc, in Japanese Yen	JPY/CHF	Swiss Yen
GLDUSD	Gold, in US Dollar per troy ounce	USD/ozXAU	Gold
SLVUSD	Silver, in US Dollar per troy ounce	USD/ozXAG	Silver



Who uses the *weird* (FC/HC) Convention?

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What have we
learned?

“with one Rupee you can buy 1/15th of a bread”?

◇ (against USD:) NY traders

- ▷ traders need a unique language
- ▷ European governments had officially fixed the rate as e.g. DEM/USD 4, their own natural quote

◇ (against GBP:) all pro's & all Brits (and similarly for ZAR, AUD, NZD, IEP)

- ▷ the pound used to be intractably nondecimal (until 1967)
 - ▷ the pound used to play the key role taken by USD after WW2
- Also US traders still do this; so they use unnatural one for e.g. CHF but natural quote for GBP etc

◇ (against EUR:) everybody

- ▷ the EUR used to be “foreign” even for Eurolanders;
- ▷ ? Europe thought the indirect quote was posher?



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What Dimensions are Standard, in Practice?



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GBPUSD	British Pound, in US Dollar	USD/GBP	Cable
GBPCHF*	British Pound, in Swiss Franc	CHF/GBP	Sterling Swiss
GBPJPY*	British Pound, in Japanese Yen	JPY/GBP	Sterling Yen
AUDUSD	Australian Dollar, in US Dollar	USD/AUD	Aussie Dollar
NZDUSD	New Zealand Dollar, in US Dollar	USD/NZD	New Zealand Dollar or Kiwi
EURUSD	Euro, in US Dollar	USD/EUR	Euro
EURGBP*	Euro, in British Pound	GBP/EUR	Euro Sterling
EURJPY*	Euro, in Japanese Yen	JPY/EUR	Euro Yen
EURCHF*	Euro, in Swiss Franc	CHF/EUR	Euro Swiss
CHFJPY*	Swiss Franc, in Japanese Yen	JPY/CHF	Swiss Yen
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Bid and Ask Rates

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What have we
learned?

◇ Bid and Ask

- ▷ You buy at (bank's) *Ask*, you sell at (bank's) *Bid*
- ▷ Bid-Ask Spread := Ask – Bid ≥ 0 (why ≥ 0 ?)

◇ Equivalent commission = 1/2 spread:

Example EUR USD = USD/EUR 1.2345 - 1.2347

- ▷ Buying (at 47) is like paying midpoint (46) + cost 1
- ▷ Selling (at 45) is like getting midpoint (46) – cost 1

◇ Determinants of bid-ask spread

- ▷ Retail: spread falls with order size
- ▷ Wholesale: spread falls when risk of posting a quote is lower:
 - high liquidity
 - low volatility
 - a normal quantity—not too large



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Spreads and Acceptable Orders

internet broker, 2007

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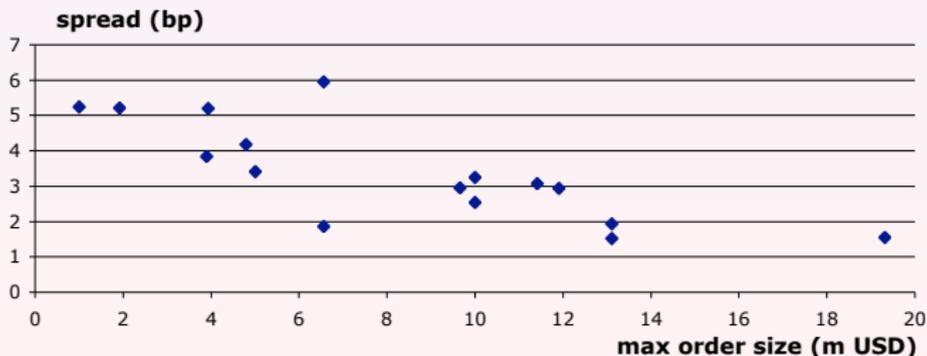
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Ticker	Size of 1.0 lot	Instant Execution	Spread	Limit & Stop levels*	March 9, 2007 rate (in pips)	spread, % ²
EURUSD	EUR 100,000	up to 10M	2 pips	2 pips	13,115	1.5
GBPUSD	GBP 100,000	up to 10M	3 pips	3 pips	19,319	1.6
EURCHF	EUR 100,000	up to 5M	3 pips	3 pips	16,163	1.9
EURJPY	EUR 100,000	up to 10M	3 pips	3 pips	15,489	1.9
USDJPY	USD 100,000	up to 10M	3 pips	3 pips	11,810	2.5
GBPCHF	GBP 100,000	up to 5M	7 pips	7 pips	23,810	2.9
EURGBP	EUR 100,000	up to 5M	2 pips	2 pips	6,788	2.9
GBPJPY	GBP 100,000	up to 5M	7 pips	7 pips	22,817	3.1
USDCHF	USD 100,000	up to 10M	4 pips	4 pips	12,325	3.2
USDCAD	USD 100,000	up to 5M	4 pips	4 pips	11,735	3.4
AUDUSD	AUD 100,000	up to 5M	3 pips	3 pips	7,802	3.8
CHFJPY	CHF 100,000	up to 5M	4 pips	4 pips	9,583	4.2
EURCAD	EUR 100,000	up to 3M	8 pips	8 pips	15,389	5.2
NZDUSD	NZD 100,000	up to 2M	5 pips	5 pips	9,583	5.2
USDSGD	USD 100,000	up to 1M	8 pips	8 pips	15,267	5.2
EURAUD	EUR 100,000	up to 5M	10 pips	10 pips	16,810	5.9





Primary and Cross Rates

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What have we
learned?

- ◇ **Primary** rate against reference or base currency (as of WW2: USD)
- ◇ **Cross** rate between two non-base currencies
 - ▷ Until mid 1980s only calculated from primary rates, never quoted independently:
 - the officially defended rates were primary, not cross
 - the cross-markets did not have enough volume to be competitive against two USD transactions
 - in pre-computer days, keeping track of a 50×50 matrix was impossible
 - ▷ now also quoted directly for important pairs



Primary and Cross Rates

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What have we
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◇ **Rule:** $1/\text{ask} = \text{bid}$, $1/\text{bid} = \text{ask}$

◇ **Why?**

▷ mathematically, $1/\text{bigger} = \text{smaller}$ and vv

Example

	USD/GBP	Inverse = GBP/USD	
bid =	1.9990	$1/1.9990 = 0.50025$	= ask
ask =	2.0010	$1/2.0010 = 0.49975$	= bid

▷ semantically, when one switches home currency, buying currency 1 becomes selling currency 2

Example: Mr X gives 1000 yen to the bank and receives 10 dollar

- to a Japanese this looks like *buying* USD 10 at JPY/USD 100
- to an American this looks like *selling* JPY 1000 at USD/JPY 0.01



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bid =	1.9990	$1/1.9990 = 0.50025$	= ask
ask =	2.0010	$1/2.0010 = 0.49975$	= bid

▷ semantically, when one switches home currency, buying currency 1 becomes selling currency 2

Example: Mr X gives 1000 yen to the bank and receives 10 dollar

- to a Japanese this looks like *buying* USD 10 at JPY/USD 100
- to an American this looks like *selling* JPY 1000 at USD/JPY 0.01



Inverting bid and asks

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◇ **Rule:** $1/\text{ask} = \text{bid}$, $1/\text{bid} = \text{ask}$

◇ **Why?**

▷ mathematically, $1/\text{bigger} = \text{smaller}$ and vv

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- ◇ **Not an organized market** (unlike eg NYSE or LSE)
- ◇ **Two tiers**: 24-h *wholesale* tier, (informal network of banks and big corporations) and a *retail* tier
- ◇ **Wholesale**: 2 kind of professionals
 - ▷ *market makers*: give two-way quotes binding up to an agreed limit (e.g USD 10m or 20m). Purely bilateral.
 - traditionally done by phone (taped, and confirmed by mail, telex or fax).
 - Since mid-90s, computer “conversation”s (Reuters 3000, EBS) dominate: faster, safer (STP).
 - ▷ *brokers*: these shop around to find takers for someone else’s offer.
 - Nowadays, Reuters and EBS run limit-order books for this purpose [⇒ mkt becomes more centralized/multilateral] , and ...
 - brokers just do the special deals (large, or “structured”)



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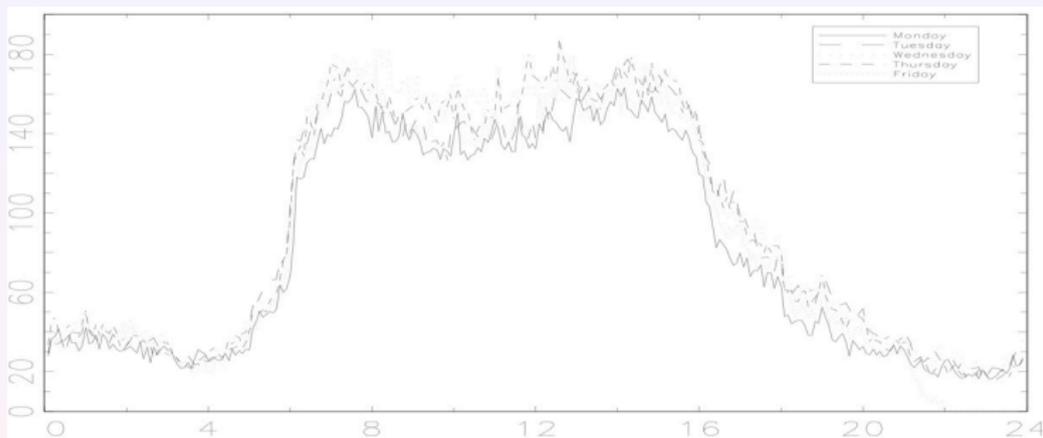
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A Reuters conversation

```

From: GENP
Hi: EUR/USD in 5 pse?
Hi 25 27 +
Mine 5 at 27 val 5/9 +
Tks $ to Citi Bibi
  
```

An EBS broking screen

Sept 3 – 10:25		5 SEP
EUR/USD	1.28	
	3 25 - 27 5	
USD/JPY	105	
	5 64 - 66 6	



A Panel of Reuters Broking Windows

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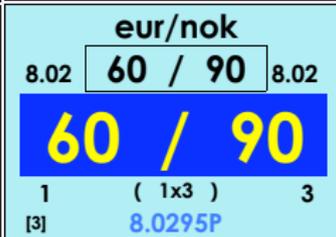
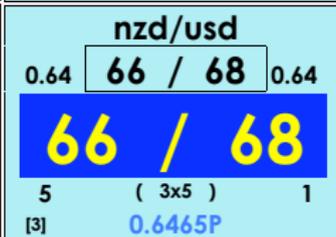
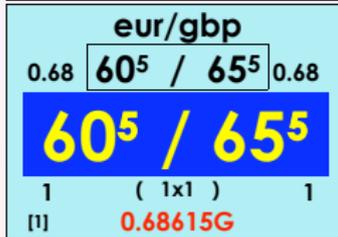
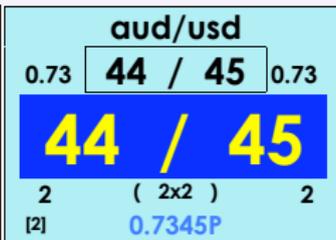
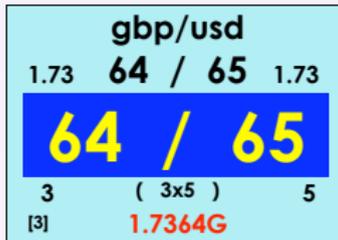
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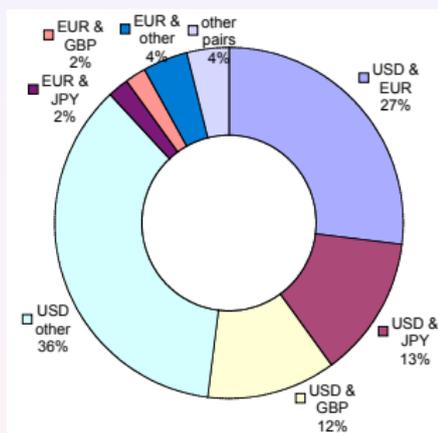
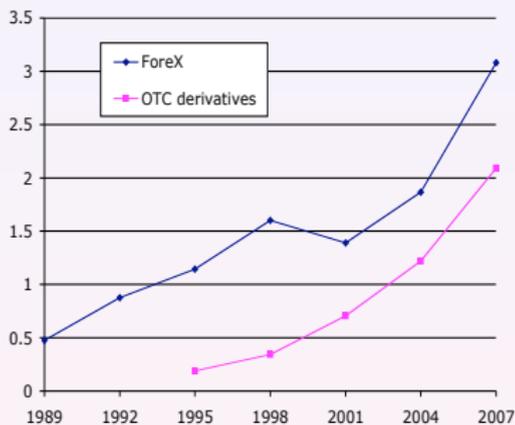
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What have we
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◇ Volume over time and by currency



◇ Major centers:

- ▷ The big 3: **London**, New York, and Tokyo — with LN > NY+TK, and growing faster
- ▷ Less important: Sydney, HK, Singapore, Zurich, and Frankfurt
- ▷ Ambitious upstart: Dubai



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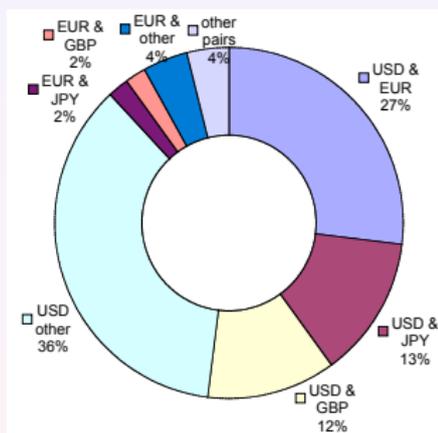
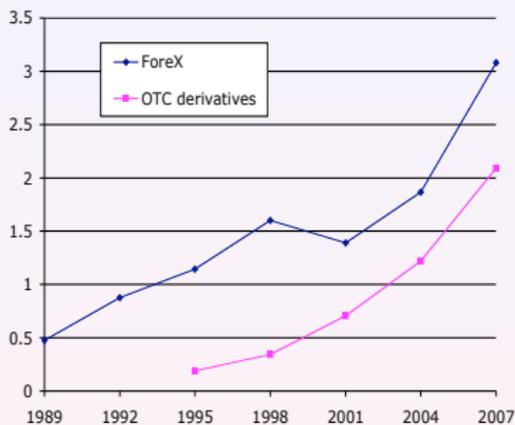
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What have we learned?

◇ **Spot** (rate: S_t) = “immediate” (t) payment/delivery

- ▷ “immediate” means 2nd working day (“ $t + 2$ ”) ($t + 1$ for US-Canada and -Mexico)
- ▷ Less than half of the market

◇ **Forward**: (rate: $F_{t,T}$) = payment/delivery at some future date ($T > t + 2$)

- ▷ nowadays up to ten years, but the most active forward markets remain “30”, “90” days (that is, $t + 2$ plus $N/30$ months);

Example

- Deal on Wedn April 19, 2000 $\Rightarrow t + 2$ means Frid April 21; “+ 180 days” means Oct 21, a Saturday, so delivery is Mond Oct 23.
- Actually 185 days.

- ▷ Quotes for any “broken” date on request.
- ▷ Volume: larger than the spot market.



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◇ **Arbitrage** (two-way)

- ▷ buy low, immediately re-sell high without risk
- ▷ arb opp: no net investment, no chance of loss, and possibly a gain
- ▷ too nice to be true: selfdestructive
- ▷ two-way trade: sum of transaction costs matters

◇ **Shopping around** (one way)

- ▷ exogenous motivation to do a particular trade—just choose in what mkt segment you'll do the trade
- ▷ difference of costs matters
- ▷ opportunities happen all the time—are often intended by mkt maker



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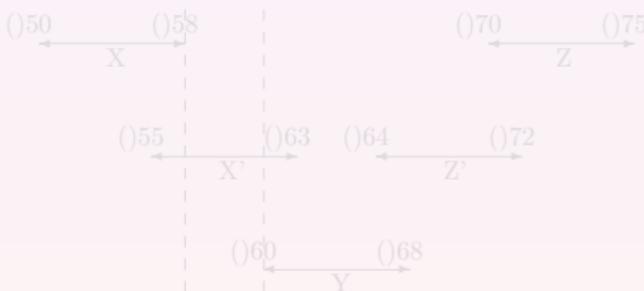
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bank X: USD/EUR xxx56 - 58

bank Y: USD/EUR xxx52 - 54

- ▷ arb opp: sure gain without really needing cash
- ▷ triggers massive flows
- ▷ \Rightarrow No-arb condition: $Bid_i \leq Ask_j \forall i, j$ —no empty space



- ▷ Is there an arb opp ...
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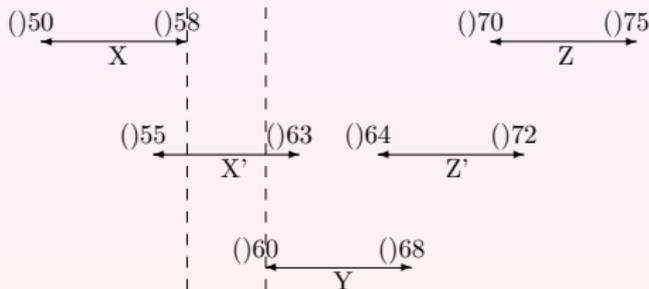
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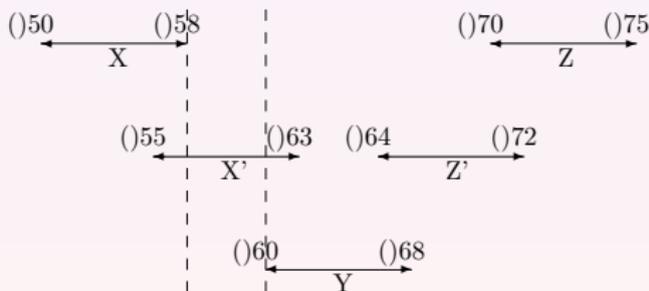
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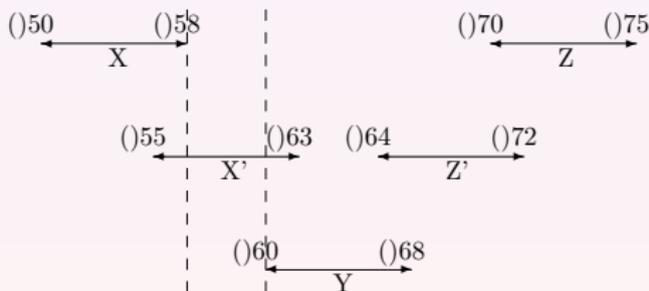
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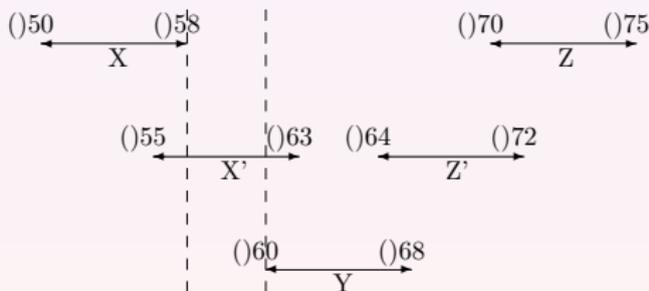
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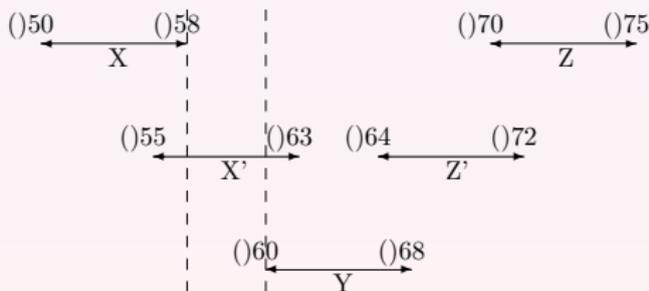
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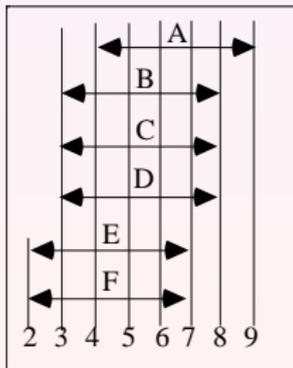
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- ▷ all buyers go to ... and all sellers to ...
- ▷ This may be (temporarily) the idea—if bank X has a (delete one:) shortage/excess, and Y a shortage/excess.
- ▷ But in the medium run X and Y's positions must vary all the time.



Exercise: Skewing the spreads

- Who, among these traders, is
 - keen on buying?
 - keen on selling?
 - just twiddling thumbs?
- Why do wannabuyers move both quotes, not just the bid?
- Why do wannasellers move both quotes, not just the ask?



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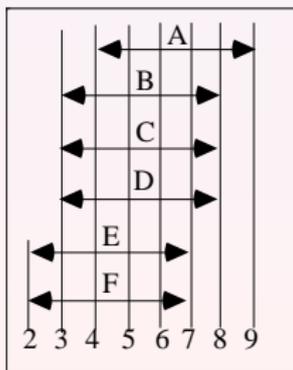
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- ▶ all buyers go to ... and all sellers to ...
- ▶ This may be (temporarily) the idea—if bank X has a (delete one:) shortage/excess, and Y a shortage/excess.
- ▶ But in the medium run X and Y's positions must vary all the time.



Exercise: Skewing the spreads

- Who, among these traders, is
 - keen on buying?
 - keen on selling?
 - just twiddling thumbs?
- Why do wannabuyers move both quotes, not just the bid?
- Why do wannasellers move both quotes, not just the ask?



Shopping Around Across Market Makers

Spot Markets

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PPP Rates and Real Rates

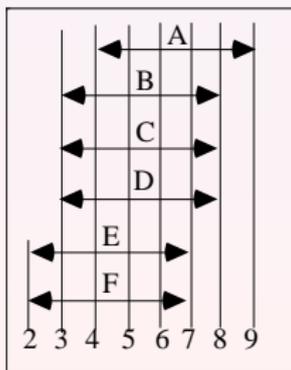
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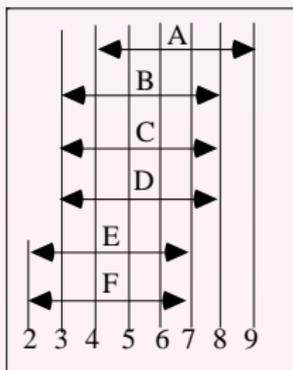
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Triangular Arbitrage and the LOP

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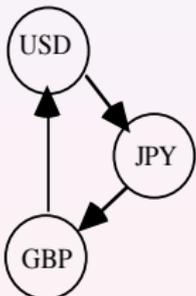
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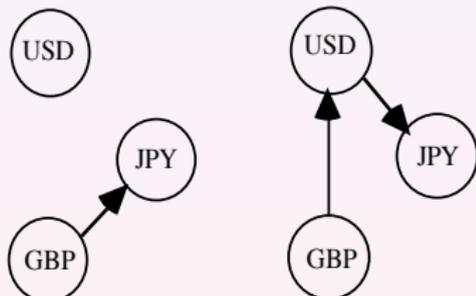
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Triangular arbitrage:
Do I make money doing this:?



is out > in?

Triangular shopping-around:
which of the two gives me the best price?



go direct or indirect?

- ◇ For either application we need to know the “synthetic” (indirect) rate JPY/GBP.



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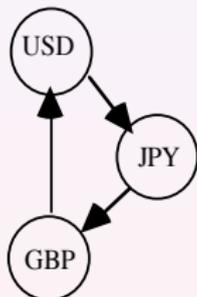
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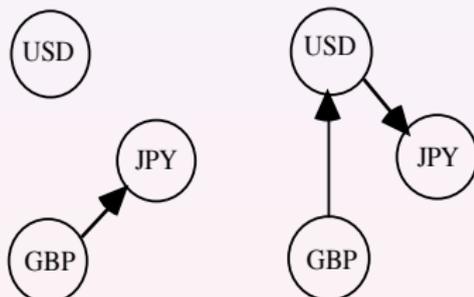
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Computing Synthetic Cross-Rates (1)

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What have we learned?

Concepts introduced in this section:

◇ Replication

A synthetic version or replication of a contract is

- a combination of two or more other transactions
- that achieves the same purpose as the original contract

◇ Rip-off Rule

Law of the Worst Possible Combination or Rip-Off Rule:

- At every single transaction we get the worse rate—hi for buy, lo for sell
- so, in a chain of transactions one always ends up with the worst possible combination



Computing Synthetic Cross-Rates (1)

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Example of synthetic rates (1)

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What have we learned?

Example

Find the cost of synthetically buying GBP against JPY if
JPY/USD 101.07 – 101.20 ,
USD/GBP 1.3840 – 1.3850

▷ Divide or multiply? Look at the dimensions:

$$[\text{JPY}/\text{GBP}] = [\text{JPY}/\text{USD}] \times [\text{USD}/\text{GBP}]$$

▷ Bid or ask? Use the Law of the Worst Possible Combination:

- Synth bid = lowest product = lo × lo
= 101.07 × 1.3840 = 139.88088
- Synth ask = highest product = hi × hi
= 101.20 × 1.3850 = 140.16200



Example of synthetic rates (1)

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Example of synthetic rates (2)

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What have we
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Example — imagine Brits quote the logical way?!

Find the cost of synthetically buying GBP against JPY if

JPY/USD 101.07 – 101.20 ,

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Example of synthetic rates (2)

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Triangular Arb: Bounds on Cross-rates

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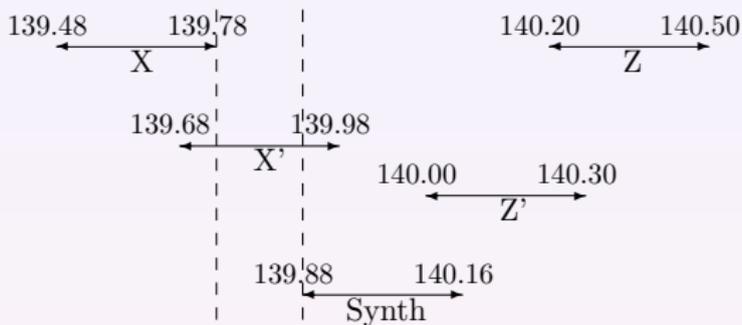
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Implication:

if the synthetic rates are 139.88088 – 140.16200, then ...

- the direct mkt can fully exist only if ...
- if so, the no-arb condition ensures that ...
- and the shopping-around effect implies that ...



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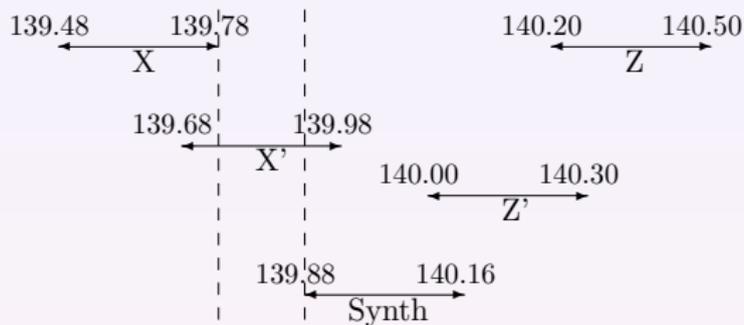
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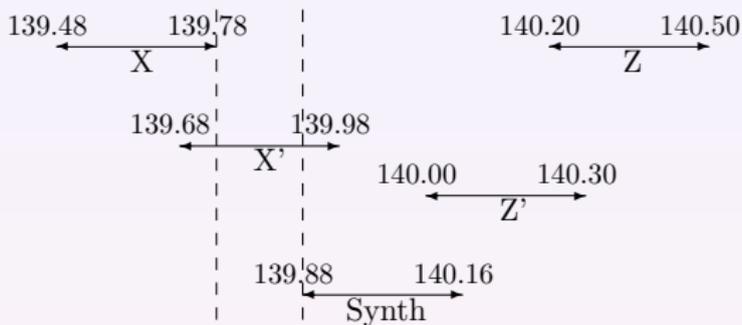
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A trader's shopping-around spreadsheet

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What have we
learned?

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
			1,4868		1,4869											
2	EUR	USD				EBS		1,4868	1,4869					27,1302	27,1320	
3	EUR	JPY	157,9300		157,9400	RD2002		1,4868	1,4869							
4	EUR	GBP	0,7477		0,7478	Reuters		1,4868	1,4871							
5	EUR	CHF	1,6050		1,6053			EUR/GBP						GBP/USD		
6	EUR	AUD	1,6673		1,6683	RD2002		0,7477	0,7478				1,9884	1,9887	RD2002	
7	EUR	CAD	1,4846		1,4853	Via USD		0,7476	0,7478				1,9884	1,9886	Via EUR	
8	EUR	CZK	26,062		26,08	Reuters		0,7477	0,7480				1,9884	1,9887	Reuters	
9	EUR	DKK	7,4527		7,4530			EUR/JPY						USD/JPY		
10	EUR	EEK	15,645		15,648	EBS		157,93	157,94				106,21	106,22	EBS	
11	EUR	HKD	11,5940		11,5960	RD2002		0,00	0,00				106,21	106,23	RD2002	
12	EUR	HUF	259,41		259,61	Via USD		157,91	157,94				106,21	106,23	Via EUR	
13	EUR	IDR	13577		13877	Reuters		157,93	157,97				106,20	106,24	Reuters	
14	EUR	ISK	96,75		96,82			EUR/CHF						USD/CHF		
15	EUR	LTL	3,4526		3,4528	EBS		1,6050	1,6053				1,0795	1,0796	EBS	
16	EUR	LVL	0,6973		0,6983	Via USD		1,6050	1,6053				1,0794	1,0797	Via EUR	
17	EUR	MYR	4,8086		4,8137	Reuters		1,6049	1,6052				1,0795	1,0798	Reuters	
18	EUR	NOK	8,0745		8,0765			EUR/SEK						USD/SEK		
19	EUR	NZD	1,8950		1,8968	RD2002		9,4715	9,4735				6,3700	6,3717	Via EUR	
20	EUR	PHP	60,19		60,257	Reuters		9,4728	9,4756				6,3698	6,3708	Reuters	



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The FC/HC Convention
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The Real Rate or Deviation from APPP
Is the RER constant? Devs from RPPP

What have we learned in this chapter?



Issues related to interpretation of S or Y^*

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What have we learned?

Two (related) issues: If price levels are very different, home v abroad, how can we measure ...

- the true meaning of a FC amount *to a local*? (PPP rate)
- the average price difference? (Real Rate, deviation from Abs PPP)
- the change in the price difference (deviations from Rel. PPP)



PPP Exchange Rates

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Example

Your friend makes FDK 2000, which seems little, against your USD 50! Data:

- ▷ “Nominal” spot rate is USD/FDK 0.010.
- ▷ A Big Meal costs USD 5 here, FDK 250 there.

Calculations:

- ▷ at the spot rate her income is $2000 \times 0.01 = \text{USD } 20 \ll 50$.
- ▷ but she spends it locally, where prices are possibly different
 - over there, she can buy $2000/250 = 8$ BigMeals
 - 8 Bigmeals would cost $8 \times 5 = \text{USD } 40$ to you here
 - so FDK 2000 means as much *to her, over there*, as USD 40 *to you, here*
 - the implied rate (“PPP rate”) is $2000/40 = 0.02$ USD/FDK:

General: $\text{PPP rate} = \Pi/\Pi^*$



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Are PPP rates far from Nominal Rates?

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What have we learned?

The Economist's Big Mac Standard:

	curren- cy	local price	actual value of \$	PPP rate of \$	real rate of \$	actual value in \$	PPP rate in \$	real rate in \$		curren- cy	local price	actual value of \$	PPP rate of \$	real rate of \$	actual value in \$	PPP rate in \$	real rate in \$
China	yuan	10.5	8.03	3.39	2.371	0.125	0.295	0.422	Estonia	kroon	29.5	12.3	9.52	1.293	0.081	0.105	0.774
Macau	pacata	11.1	7.99	3.58	2.231	0.125	0.279	0.448	Saudi Arabia	riyal	9	3.75	2.90	1.292	0.267	0.344	0.774
Malaysia	ringgit	5.5	3.63	1.77	2.046	0.275	0.564	0.489	Lithuania	litas	6.5	2.69	2.10	1.283	0.372	0.477	0.779
Hong Kong	dollar	12	7.75	3.87	2.002	0.129	0.258	0.499	Australia	dollar	3.25	1.33	1.05	1.269	0.752	0.954	0.788
Indonesia	rupia	14600	9325	4709.68	1.980	0.000	0.000	0.505	UAE	dirham	9	3.67	2.90	1.264	0.272	0.344	0.791
Philippines	peso	85	52.6	27.42	1.918	0.019	0.036	0.521	Latvia	lats	1.35	0.55	0.44	1.263	1.818	2.296	0.792
Paraguay	guarani	9000	5505	2903.23	1.896	0.000	0.000	0.527	Mexico	peso	29	11.3	9.35	1.208	0.088	0.107	0.828
Egypt	pound	9.5	5.77	3.06	1.883	0.173	0.326	0.531	Colombia	peso	6500	2504	2096.77	1.194	0.000	0.000	0.837
Ukraine	hryvna	8.5	5.05	2.74	1.842	0.198	0.365	0.543	Croatia	kuna	15	5.72	4.84	1.182	0.175	0.207	0.846
Moldava	leu	23	13.2	7.42	1.779	0.076	0.135	0.562	South Korea	won	2500	952	806.45	1.180	0.001	0.001	0.847
Uruguay	peso	42.3	23.9	13.65	1.752	0.042	0.073	0.571	Czech Rep	koruna	59.05	22.1	19.05	1.160	0.045	0.052	0.862
Russia	ruble	48	27.1	15.48	1.750	0.037	0.065	0.571	Fiji	dollar	4.65	1.73	1.50	1.153	0.578	0.667	0.867
Dominican Rep	peso	60	32.6	19.35	1.684	0.031	0.052	0.594	Hungary	forint	560	206	180.65	1.140	0.005	0.006	0.877
Sri Lanka	rupee	190	103	61.29	1.681	0.010	0.016	0.595	Turkey	lire	4.2	1.54	1.35	1.137	0.649	0.738	0.880
Honduras	lempira	35.95	18.9	11.60	1.630	0.053	0.086	0.614	New Zealand	dollar	4.45	1.62	1.44	1.129	0.617	0.697	0.886
Bulgaria	lev	2.99	1.54	0.96	1.597	0.649	1.037	0.626	Slovenia	tolar	520	189	167.74	1.127	0.005	0.006	0.888
Slovakia	lora	58	29.5	18.71	1.577	0.034	0.053	0.634	Aruba	florin	4.95	1.79	1.60	1.121	0.559	0.626	0.892
Poland	zloty	6.5	3.1	2.10	1.478	0.323	0.477	0.676	Brazil	real	6.4	2.3	2.06	1.114	0.435	0.484	0.898
Thailand	baht	60	28.4	19.35	1.467	0.035	0.052	0.682	Morocco	dirham	24.5	8.71	7.90	1.102	0.115	0.127	0.907
South Africa	rand	13.95	6.8	4.50	1.467	0.152	0.222	0.682	Peru	new sol	9.5	3.26	3.06	1.064	0.307	0.326	0.940
Pakistan	rupee	130	60.1	41.94	1.433	0.017	0.024	0.698	Chile	peso	1560	530	503.23	1.053	0.002	0.002	0.949
Venezuela	bolivar	5701	2630	1839.03	1.430	0.000	0.001	0.699	United states	dollar	3.1	1	1.00	1.000	1.000	1.000	1.000
Costa Rica	colon	1130	510	364.52	1.399	0.002	0.003	0.715	Canada	dollar	3.52	1.12	1.14	0.986	0.893	0.881	1.014
Japan	yen	250	112	80.65	1.389	0.009	0.012	0.720	Britain	pound	1.94	0.532	0.63	0.850	1.880	1.598	1.176
Singapore	dollar	3.6	1.59	1.16	1.369	0.629	0.861	0.730	Euroland	euro	2.94	0.781	0.95	0.824	1.280	1.054	1.214
Guatemala	quetzal	17.25	7.59	5.56	1.364	0.132	0.180	0.733	Sweden	krona	33	7.28	10.65	0.684	0.137	0.094	1.462
Argentina	peso	7	3.06	2.26	1.355	0.327	0.443	0.738	Denmark	kroner	27.75	5.82	8.95	0.650	0.172	0.112	1.538
Georgia	lari	4.15	1.8	1.34	1.345	0.556	0.747	0.744	Switzerland	franc	6.3	1.21	2.03	0.595	0.826	0.942	1.680
Taiwan	dollar	75	32.1	24.19	1.327	0.031	0.041	0.754	Iceland	kronur	459	72	148.06	0.486	0.014	0.007	2.056
									Norway	kroner	43	6.1	13.87	0.440	0.164	0.072	2.274

Are PPP rates far from Nominal Rates?

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PPP Rates and Real Rates

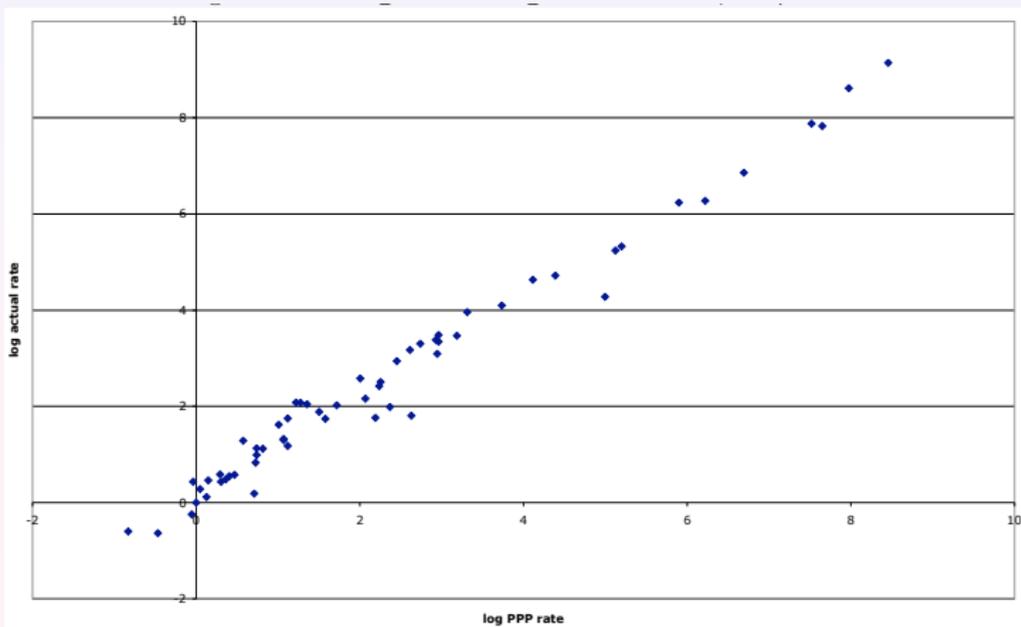
PPP Exchange Rates

The Real Rate (dev from
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Deviations from RPPP

What have we learned?

If we plot log against log, the link seems close:





Are PPP rates far from Nominal Rates?

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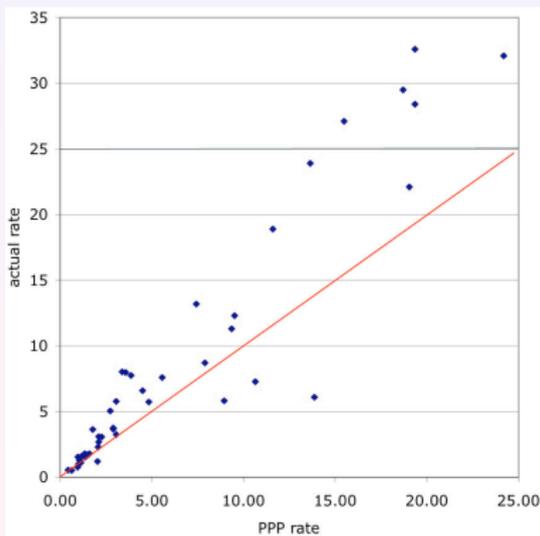
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What have we learned?

If we plot untransformed figures, we see big deviations:



Rates are in FC/USD, so a dot below the 45-degree line means the dollar is below PPP.



The Real Rate or Deviation from APPP

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What have we learned?

- ▷ RER measures the difference between S and \hat{S}^{PPP} :

$$\text{Real XRate} := \frac{S}{\hat{S}^{PPP}}$$

- ▷ RER is also the ratio between the translated price levels:

$$\text{Real XRate} := \frac{S}{\Pi/\Pi^*} = \frac{S\Pi^*}{\Pi} = \frac{\text{translated } \Pi^*}{\text{home } \Pi}$$

So RER tells us what country is more expensive, and by how much.

- ▷ **Absolute PPP** is said to hold if

$$\text{A PPP: } RER_t = 1 \Leftrightarrow S_t = \hat{S}_t^{PPP} \Leftrightarrow S_t \times \Pi_t^* = \Pi_t$$



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Deviations from BigMacParity

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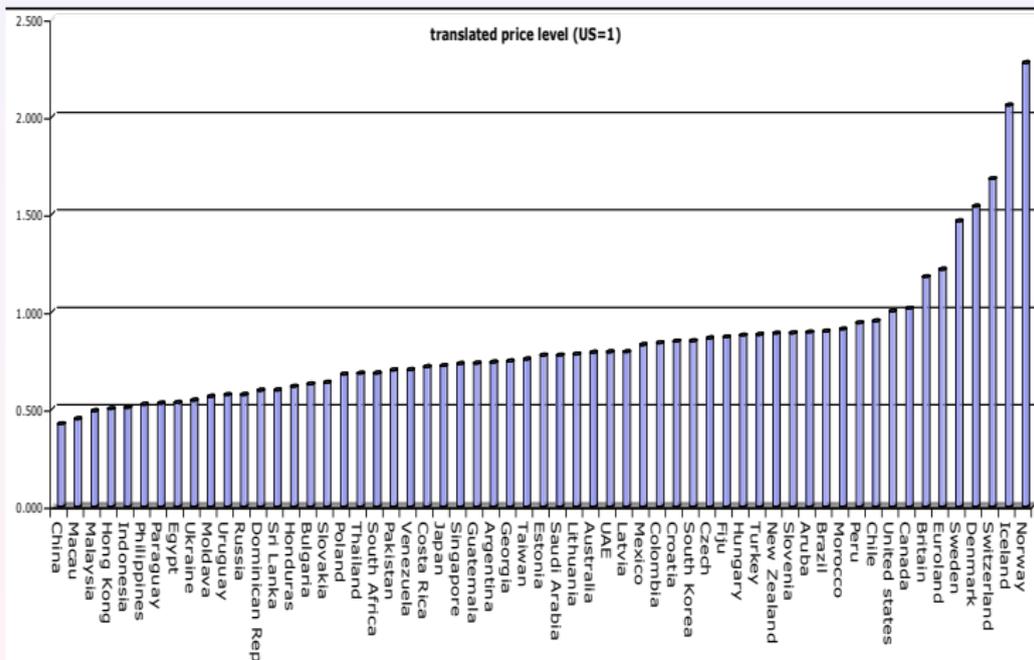
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What have we learned?

Example

BigMac costs 3.10 in the US and 155 in Freedonia, and the spot rate is 100 Crowns per dollar; complete Freedonia's PPP rates in the table:

	curren- cy	local price	actual value of \$	PPP rate of \$	real rate of \$	actual value in \$	PPP rate in \$	real rate in \$
Freedonia	korona	155	100					

Example: 2006 GDPs translated into USD

	at S	at \hat{S}^{PPP}	ratio b/a
Russia	741 b	1 589 b	2.15
China	2 225 b	8 883 b	3.99

(<http://www.cia.gov/cia/publications/factbook/geos/rs.html>)



Deviations from BigMacParity

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Deviations from Relative PPP

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What have we learned?

◇ Issue?

- ▷ If Absolute price data are missing, we cannot compute the RER
- ▷ But we can still know whether RER is up or down, relative to a base period:

$$\begin{aligned}\frac{RER_t}{RER_{t_0}} &= [S_t/S_{t_0}] \frac{\Pi_t^*/\Pi_{t_0}^*}{\Pi_t/\Pi_{t_0}} \\ &= (1 + s_{t_0,t}) \frac{1 + infl_{t_0,t}^*}{1 + infl_{t_0,t}} - 1 \\ &\approx s_{t_0,t} + [infl_{t_0,t}^* - infl_{t_0,t}]\end{aligned}$$

where *infl* and *infl** can be proxied by local CPI inflation rates if Absolute price levels are missing.

- ▷ If the RER has not changed, **Relative PPP** is said to hold.



Deviations from Relative PPP

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Is the RER constant? (RPPP deviations?)

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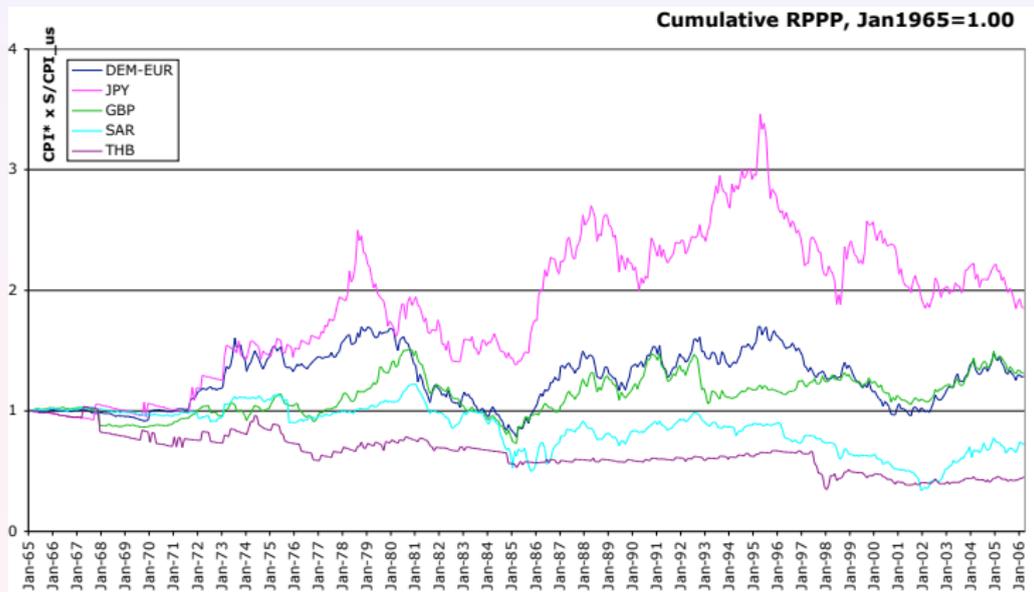
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What have we
learned?

Real value of 4 currencies, from US perspective, relative to 1965





Is the RER constant? (RPPP deviations?)

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What have we
learned?

Nominal and RPPP value of GBP against USD, relative to 1965





Is the RER constant? (RPPP deviations?)

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Nominal and RPPP value of JPY against USD, relative to 1965



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learned?

Nominal and RPPP value of ZAR against USD, relative to 1965





Is the RER constant? (RPPP deviations?)

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learned?

Nominal and RPPP value of THB against USD, relative to 1965





Things on RERs to be Remembered Forever

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What have we learned?

◇ **RER Behavior**

- ▷ huge swings: halving/doubling in a matter of years
- ▷ high inertia (autocorrelation) in short run: halflife is like 5 yrs
- ▷ most of the variability comes from nominal rate, not PPP rate
 - this is good: nominal rate can be hedged
- ▷ S is hard to predict — claim to be substantiated later



More Things to be Remembered Forever

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◇ Financial Policy Implications

- ▷ RER movements can force a company to radically change its strategy
 - 1970s: VW abandoned export strategy, became multinational producer
 - 1980s: John Deere, International Harvester lost their export markets
- ▷ Even nominal movements can kill a company
 - 1990s: Slite (FI) went belly up because the FIM had devalued
- ▷ If rates would move predictably, we could prepare operationally, eg move production, change sourcing & prices
- ▷ Since rates move unpredictably, financial hedging seems useful.
 - first we need to show whether/when such hedging adds value
 - then we need to know our *exposure*, which determines the size of the damage and the size of the hedge
 - we need to select the hedge instrument: forwards, futures, options, swaps?



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The FC/HC Convention

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- ◇ Exchange rates, in this text, are always shown as **HC/FC**. **Market makers** quote them as **bid-ask**, with the **spread** determined by risk considerations (which?).
- ◇ The market is traditionally a **bilateral** otc market (“conversations”), but is now becoming more **multilateral** (Reuters 3000 & EBS auctions).
- ◇ There are **spot** and **forward** segments.
- ◇ Even in purely bilateral markets, prices are (imperfectly) unified across market makers by **arbitrage** and by **shopping-around**. True, traders often **skew** their bids—but just until their desired trade has been achieved.



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What have we learned?

◇ In **triangular arbitrage**, we came across our first example of **replication** or **synthetic versions** of contracts, and discovered the **Law of the Worst Possible Combination**.

◇ Two complementary notions help us interpret S :

- *Translation* at the **PPP rate**, $\hat{S}^{\text{PPP}} := \Pi/\Pi^*$, tells us what a FC amount really means over there, expressed in terms you understand: how much should I make *here* to be able to spend as much as that amount buys *there*.
- The **real rate**, $RER := S/\hat{S}^{\text{PPP}} = [S\Pi^*]/\Pi$, tells me how much more expensive the foreign country is.

◇ There are two related PPP notions:

- If $RER=1$, **Absolute PPP** is said to hold.
- If the RER is constant, **Relative PPP** is said to hold.

If absolute price data are missing, we can still approximate the % change in the RER by the % changes in the spot rate and the two CPIs:

$$(1 + s)(1 + inf^*)/(1 + inf) - 1.$$



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What have we learned?

- ◇ In practice, **real rates are not equal to unity and vary a lot over time**:
 - **Long** swings with slow mean-reversion
 - Swings are **big**—the rate can double or even triple in a few years
 - For mainstream countries, most of the variation of the *RER* comes from the **nominal** rate, and these are **hard to predict**.
- ◇ **Implications for the CFO**:
 - Variations in *RER* can have a big impact and may force you to change strategy
 - Variations in *S* may also hurt you via capital losses
 - We still need to determine whether hedging adds value, though
 - If answer is positive, we need to understand/choose a hedge: forwards, futures, swaps, options?



What more have we learned in this chapter?

Spot Markets

P. Sercu,
*International
Finance: Theory into
Practice*

Exchange Rates

Major Markets

The LOP in Spot Mkts

PPP Rates and Real Rates

What have we learned?

- ◇ In practice, **real rates are not equal to unity and vary a lot over time**:
 - **Long** swings with slow mean-reversion
 - Swings are **big**—the rate can double or even triple in a few years
 - For mainstream countries, most of the variation of the *RER* comes from the **nominal** rate, and these are **hard to predict**.

- ◇ **Implications for the CFO**:
 - Variations in *RER* can have a big impact and may force you to change strategy
 - Variations in *S* may also hurt you via capital losses
 - We still need to determine whether hedging adds value, though
 - If answer is positive, we need to understand/chose a hedge: forwards, futures, swaps, options?