

An Overview of the Foreign Exchange Market

1. Introduction – What's Exciting and Interesting About FX?
2. Foreign Exchange Basics – Contracts, Actors and Activities
3. Dimensions of the Foreign Exchange Market – BIS Survey
 - Daily Volume of Trading by Location
 - Daily Volume of Trading by Contract Type
 - Daily Volume of Trading by Currency of Denomination
 - Daily Volume of Trading by Contract Type and Counterparty
4. Organizational Structure of the Foreign Exchange Market
 - Executing Transactions in a Geographically Dispersed Market
 - The Role of Brokers and Dealing Banks
 - A Typical Day in the Foreign Exchange Market
 - A Typical Day for a Foreign Exchange Trader
 - How Profitable is FX Trading?
 - Foreign Exchange Trading Risks and Control Measures
5. The Relationship Among Spot Rates, Forward Rates, and Money Market Rates
 - How Forward Rates Are "Constructed"
 - Replicating Domestic (Foreign) Interest Rates Using Foreign (Domestic) Interest Rates
 - Creating Synthetic Instruments: Long-dated forwards, swap-driven bonds, short-term commercial paper

Richard M. Levich

New York University

Introduction – What's Exciting and Interesting About FX?

- Possibly world's oldest financial market
- Definitely world's largest financial market
- Like other financial markets, foreign exchange has been subject to tremendous innovation and change over the last 20 years
 - New products
 - New market participants
 - New trading mechanisms and trading technology

All of above pose competitive threats (and opportunities) for market participants

- Foreign exchange plays a central role in the global economy
 - As a medium of exchange to facilitate the *flow* of global trade in goods and services
 - As a medium of exchange to facilitate the purchase and sale of foreign securities
 - As a medium to “re-denominate” and manage the currency risk of *stock* asset and liability positions

Foreign Exchange Basics – Contracts, Actors and Activities

Contracts

Spot Contracts

- An exchange of two currencies for “immediate delivery”
 - ⇒ exchange of bank balances in 2 business days (1 day N. American currencies)
- A binding commitment
- Quoting conventions

Direct terms, also called American terms: US\$/foreign currency

Indirect terms, also called European terms: Foreign Currency/US\$

Foreign Exchange Swaps

- A simultaneous borrowing and lending of short-term bank balances in two currencies

For example, bank A borrows \$10 million from bank B for 1-month, and bank B borrows \$10 million worth of £ from bank A for 1-month
- Quoting convention

So-called “swap points” represent the interest rate differential between the two currencies over the tenure of the swap
- Foreign exchange swaps are an old product, and part of a long-standing method for FX dealers to construct “outright” forward contracts and manage the dealer’s FX risk (more on this later)
- NOTE: a foreign exchange swap is *not* a capital market swap (Chapter 13)

Foreign Exchange Basics – continued

Forward Contracts

- Agreement made today for obligatory exchange of funds at a specified time in the future
- Common maturities – 1, 2, 3, 6, 12 months, odd dates possible but more costly.
- No exchange of funds on agreement day, or at any time until settlement date
- Delivery of funds versus “cash settlement” (non-deliverable forward)
- Quoting conventions
 - Outright forward – in either European or American terms as for spot
 - Percentage premium or discount
 - Swap points (discussed later)
- Forwards (the interbank product) ≠ Futures (the exchange traded product)
 - Both forward and futures are contracts struck today for an obligatory exchange at a later date
 - Forwards: OTC, interbank product
Contract size and maturity date flexible
No initial cash outlay or cash flows until settlement
Counterparties are banks and financial institutions, variable credit risk
Low transparency
 - Futures: Exchange-traded product
Contract size and maturity date fixed
Initial cash outlay (performance margin) and continuing cash flows (mark-to-market) until settlement
Counterparty is a clearinghouse, common (low) credit risk
Greater transparency

Foreign Exchange Basics – continued

Forward Contracts – Quoting Convention, Percentage Premium or Discount

Let F = forward rate S = spot rate
N = number of months P = forward premium (or discount)

Definition: *Annualized percentage premium*

$$P = \frac{F - S}{S} \times \frac{12}{N} \times 100$$

if $P > 0$, forward premium (on the currency quoted)

if $P < 0$, forward discount (on the currency quoted)

Example 1: Let F = 1.9600 \$/£ S = 1.9500 \$/£ N = 3 months

$$P = \frac{1.96 - 1.95}{1.95} \times \frac{12}{3} \times 100 = 2.05\% \text{ (premium on forward £)}$$

Example 2: Let F = 1.9400 \$/£ S = 1.9500 \$/£ N = 6 months

$$P = \frac{1.94 - 1.95}{1.95} \times \frac{12}{6} \times 100 = -1.03\% \text{ (discount on forward £)}$$

Note the following:

£ at a forward premium <==> \$ at forward discount
£ at a forward discount <==> \$ at forward premium

Calculations will be effected if the exchange rates are in European terms rather than in American terms.

Foreign Exchange Basics – continued

Currency Appreciation and Depreciation

Appreciation of the US\$ against the £ \Leftrightarrow Depreciation of £ against the US\$

Depreciation of the US\$ against the £ \Leftrightarrow Appreciation of £ against the US\$

Examples:

\$1.50/£ to \$1.75/£ \Rightarrow Appreciation of the £ against the US\$

\$1.50/£ to \$1.25/£ \Rightarrow Depreciation of the £ against the US\$

Note: exact percentage magnitudes of appreciation and depreciation will differ unless we measure the rate of change in continuous or logarithmic terms.

NOTE FURTHER – OUR CONVENTION:

An $x\%$ *depreciation* of the Mexican peso means it takes $x\%$ *more* MP to buy a unit of foreign currency.

A $y\%$ *appreciation* of the \$ means it takes $y\%$ *fewer* \$ to buy a unit of foreign currency.

Example: If the Mexican peso depreciates from MP4/\$ to MP8/\$, we would describe this as a 100% devaluation of the peso. The same movement could also be described as a 50% appreciation of the US\$, from \$0.25/MP to \$0.125/MP.

With this convention, a currency could depreciate by 10,000% (or more) but only appreciate by 99.9999...%. So a devaluation of the Rupiah from 2,000/US\$ to 10,000/US\$ would be called a 400% devaluation in our convention.

Another equally reasonable convention would allow any degree of appreciation but limit the amount of depreciation to 99.9999...%. In this convention, the same Rupiah move from 2,000 to 10,000 would be called an 80% devaluation of the Rupiah, because the Rupiah which was once worth \$0.00050 had fallen by 80% to only \$0.00010 .

D BE CAREFUL!

Foreign Exchange Basics – continued

Actors – Interbank Market

- Dealers (a.k.a. market-makers)
 - Usually employed by major commercial banks or security firms
 - Prepared to give 2-way quotations (“bid” and “ask”) immediately and all times (no market withdrawal)
 - Willing to accumulate inventories of long and short positions, for short periods
- Brokers
 - Traditional voice broker – collects 2-way quotes from many dealers and reports the *'Inside Spread'*

Suppose that there are many dealers in the €/ \$ market

Dealer A: 1.1530 - 1.1540	Dealer D: 1.1532 - 1.1545
Dealer B: 1.1532 - 1.1545	Dealer E: 1.1528 - 1.1540
Dealer C: 1.1533 - 1.1543	Dealer F: 1.1528 - 1.1538

Buying \$: Customers want the lowest price
Selling \$: Customers want the highest price

The combination of the lowest ASK and highest BID price is known as the ‘ Inside Spread. In the quotations above, 1.1533- 1.1538 €/ \$ from [Dealer C; Dealer F] is the inside spread.

A broker who provides information on the inside spread provides a valuable service.

- Electronic broker – Computer software collects 2-way quotes from participating dealers
 - Software allows electronic conversations and trading among dealers and automatically screens for acceptable counterparties and trading limits
- Corporate Customers – Transact with bank’ s “ corporate traders” at interbank prices plus some mark-up
- Central Banks – Intervene from time-to-time to “ smooth disorderly markets” or defend an exchange rate target

Foreign Exchange Basics – continued

Activities

Hedging: Transactions that offset (reduce) exposure (sensitivity) to a particular type of risk – currency risk, interest rate risk, basis risk, commodity price risk, etc.

Hedging transactions may add counterparty risks, while offsetting exposures to price risks.

Speculation: Transactions that increase exposure (sensitivity) to a particular type of risk – currency risk, interest rate risk, basis risks, commodity price risk, etc.

Speculative transactions also may add counterparty risks, in addition to raising exposures to certain price risks.

Arbitrage: Transactions intended to take advantage of observed pricing discrepancies, and earn profits with little or no exposure to risk

- Spatial arbitrage

For a single currency, spatial arbitrage refers to price differences across market locations or dealers.

$$\$/DM \text{ (NY)} \neq \$/DM \text{ (London)} \quad \$/DM \text{ (Dealer A)} \neq \$/DM \text{ (Dealer B)}$$

- Triangular arbitrage

For three currencies, triangular parity implies: $SF/MP = SF/\$ \times \$/MP$

Importance of triangular parity for constructing “cross rates”

Direct markets in DM/£ were observed, but prices constrained by

$$DM/£ = DM/\$ \times \$/£$$

Foreign Exchange Basics – continued

Activities -- continued

Role of \$ as “ vehicle currency” .

With the Euro (€), will cross rates like the ¥/AUD be constructed using the \$ or € as the intermediary currency?

$$¥/AUD = ¥/\$ \times \$/AUD$$

$$¥/AUD = ¥/€ \times €/AUD$$

What about the Swiss Franc/Brazilian real cross rate? Will the \$ or € play the role as the vehicle?

$$SF/BR = SF/\$ \times \$/BR$$

$$SF/BR = SF/€ \times €/BR$$

- Covered Interest Arbitrage

Refers to arbitrage among spot rates, forward rates, and money market interest rates.

Discussed in more detail later.

- Transaction costs effect all types of arbitrage

Transaction costs imply a Bid/Ask spread

Instead of a parity line, there is a zone, or neutral band around the parity line.

Within the neutral band, there are deviations from exact parity, but no profitable arbitrage opportunities after taking transaction costs into account.

Table 3.1: Dimensions of the Foreign Exchange Market
Daily Volume of Trading by Location (in billions of US\$)

Country	April 1989 Turnover (% share)	April 1992 Turnover (% share)	April 1995 Turnover (% share)	April 1998 Turnover (% share)
United Kingdom	184 (25.6%)	290 (27.0%)	464 (29.5%)	637 (32%)
United States	115 (16.0%)	167 (15.5%)	244 (15.5%)	351 (18%)
Japan	111 (15.5%)	120 (11.2%)	161 (10.2%)	149 (8%)
Singapore	55 (7.7%)	74 (6.9%)	105 (6.7%)	139 (7%)
Hong Kong	49 (6.8%)	60 (5.6%)	90 (5.7%)	79 (4%)
Switzerland	56 (7.8%)	66 (6.1%)	86 (5.5%)	82 (4%)
Germany	--- (na)	55 (5.1%)	76 (4.8%)	94 (5%)
France	23 (3.2%)	33 (3.1%)	58 (3.7%)	72 (4%)
Australia	29 (4.0%)	29 (2.7%)	40 (2.5%)	47 (2%)
Others	96 (13.4%)	182 (16.9%)	248 (15.8%)	321 (16%)
Total	718 (100%)	1,076 (100%)	1,572 (100%)	1,971 (100%)
<i>Adjustments</i>				
Less cross-border double counting	-184	-291	-435	-537
"net-net" turnover	534	785	1,137	1,434
Plus estimated gaps in reporting	56	35	53	56
Equals estimated global turnover in "traditional" market segments	590	820	1,190	1,490
Plus futures and options	30	60	70	Not available
Grand Total	620	880	1,260	Not available

- Notes: 1. Country figures are net of local inter-dealer double counting.
2. Survey data for 1989 drawn from 21 countries. Survey data for 1992 and 1995 drawn from 26 countries. Survey data for 1998 drawn from 43 countries. Different coverage may affect comparisons.
3. Futures and options include OTC and exchange-traded contracts.

Source: Bank for International Settlements, Central Bank Survey of Foreign Exchange and Derivatives Market Activity, May 1996, [Table F-2 and Table 2-A] and 19 October 1998 BIS Press Release.

Table 3.4: Dimensions of the Foreign Exchange Market
Daily Volume of Trading by Currency of Denomination (in billions of US\$)

Currency	April 1989 Turnover (% share)	April 1992 Turnover (% share)	April 1995 Turnover (% share)	April 1998 Turnover (% share)
US dollar	90	82	83	87
Deutsche mark	27	40	37	30
Japanese yen	27	23	24	21
Pound sterling	15	14	10	11
French franc	2	4	8	5
Swiss franc	10	9	7	7
Canadian dollar	1	3	3	4
Australian dollar	2	2	3	3
ECU and other EMS	4	12	15	17
Other	19	11	10	15
Total	200	200	200	200

Notes: 1. Percentage shares sum to 200.0% because two currencies are involved in each transaction.

Source: Bank for International Settlements, Central Bank Survey of Foreign Exchange and Derivatives Market Activity, May 1996, [Table F-3 for percentage shares and Table 1-D for volume of turnover] and 19 October 1998 BIS Press Release.

Table 3.3: Dimensions of the Foreign Exchange Market
Daily Volume of Trading by Contract Type (in billions of US\$)

Contract Type	April 1989 Turnover (% share)	April 1992 Turnover (% share)	April 1995 Turnover (% share)	Percentage Change, 1989-1992	Percentage Change, 1992-1995
Total	718 ^a (100%)	1,076 ^a (100%)	1,572 (100%)	38%	46%
Spot	427 (69.5%)	541 (50.7%)	680 (43.3%)	17%	26%
Outright Forward	22 (3.6%)	70 (6.6%)	115 (7.3%)	218%	64%
Foreign Exchange Swaps	165 (26.9%)	457 (42.8%)	777 (49.4%)	177%	70%
Maturity					
t ≤ 7 days	na	294 (64.3%)	552 (71%)	na	43%
7 days < t ≤ 1 year	na	158 (34.5%)	218 (28%)	na	49%
t > 1 year	na	5.5 (1.2%)	8 (1%)	na	32%

Note: Sum of components do not add to total, as in original survey.

Source: Bank for International Settlements, Central Bank Survey of Foreign Exchange and Derivatives Market Activity, May 1996 [Tables 2-A, 2-B, 2-C and 2-D] and Bank for International Settlements, Central Bank Survey of Foreign Exchange Activity, March 1993 [Table 5-A].

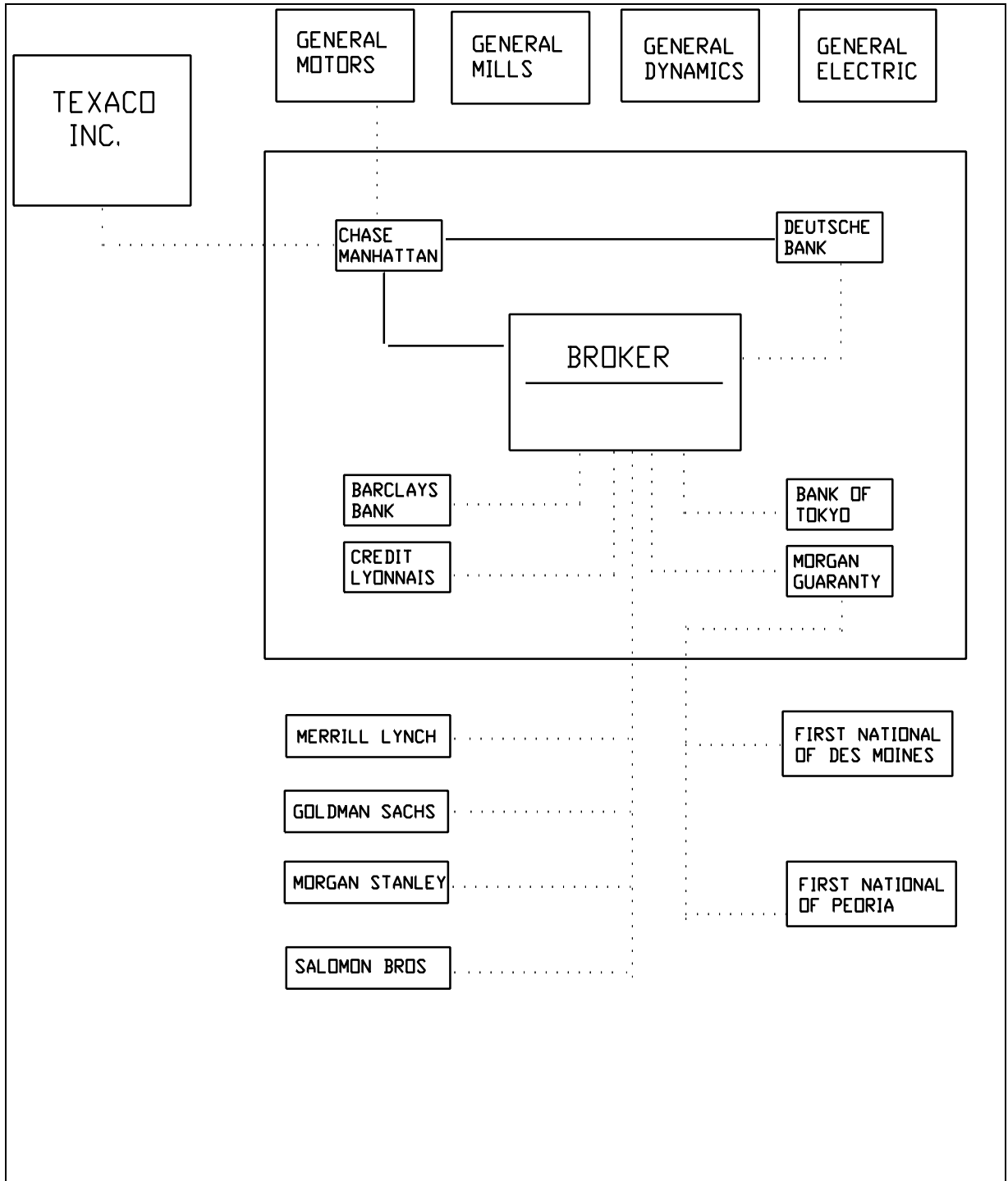
Table 3.6: Dimensions of the Foreign Exchange Market, April 1995										
Daily Volume of Trading by Contract Type, Counterparty and Location of Counterparty										
			Billions of US\$				Percentage Share			
			Spot	Outright Forward	Foreign Exchange Swaps	Total Turnover	Spot	Outright Forward	Foreign Exchange Swaps	Total Turnover
Total			679.8	115.5	776.6	1571.8				
With Dealers			510.5	52.0	601.2	1163.7	75.1%	45.0%	77.4%	74.0%
Local			138.1	14.8	139.8	292.7				
Cross-border			372.4	37.3	461.4	871.1				
With Other Financial Institutions			94.4	27.8	107.6	229.9	13.9%	24.1%	13.9%	14.6%
Local			42.7	19.3	50.3	112.3				
Cross-border			51.7	8.5	57.4	117.6				
With Non-Financial Customers			74.8	35.6	67.8	178.2	11.0%	30.8%	8.7%	11.3%
Local			50.0	25.7	45.2	120.9				
Cross-border			24.8	9.9	22.6	57.3				
All Local Transactions			230.9	59.8	235.2	525.9	34.0%	51.8%	30.3%	33.5%
All Cross-Border Transactions			448.9	55.6	541.4	1045.9	66.0%	48.2%	69.7%	66.5%

Note: Turnover is measured net of local inter-dealer double-counting.

Source: Bank for International Settlements, Central Bank Survey of Foreign Exchange and Derivatives Market Activity, May 1996. [Tables 1-H, 1-I, 1-J, and 1-K]

FIGURE 3.4

STRUCTURE OF THE FOREIGN EXCHANGE MARKET



Foreign Exchange Market Microstructure: Empirical Findings About the % Bid-Ask Spread

Based on analysis of quotes on the \$/DM spot rate retrieved from the Reuters quote screen system, studies typically show that the Bid-Ask spread (a measure of the cost of liquidity services in the market)

- Varies throughout the day
- Increases as volatility in the spot rate increases
- Decreases when more dealers are in the market

Holding other factors constant

- Spreads fall when more large dealers are in the market
- Spreads rise when more small dealers are in the market

The bid-ask spread tends to be **higher**

- At the start of a trading day (as traders get a “feel” for the market)
- At the end of the trading day (inventory adjustment to square book)

The above has been observed even for the London “close” and New York “open” which overlap.

More over, the bid-ask spread tends to be **higher**

- Fridays at closing
- Mondays on opening
- Last day of the month
- Pacific and European holidays

possibly related to fewer dealers in the market at these times.

Sources: Roger Huang and Ronald Masulis, “FX Spreads and Dealer Competition Across the 24-hour Trading Day,” Vanderbilt University working paper #95-17, August 1997; and David Hsieh and Allan Kleidon, “Bid-Ask Spreads in Foreign Exchange Markets,” in Frankel, Galli and Giovanni (eds.), *The Microstructure of Foreign Exchange Markets*, (Chicago: University of Chicago Press), 1996.

Table 3.7

Trading Statistics for an Actual Spot DM Interbank Dealer

	<u>Direct Transactions</u>	<u>Brokered Transactions</u>	<u>Total Transactions</u>
Number of Transactions	190	77	267
Value of Transactions	\$0.8 billion	\$0.4 billion	\$1.2 billion
Median Transaction Size	\$3.0 million	\$4.0 million	na
Median Spread Size	DM 0.0003	na	na

Note: The above figures are daily averages for a single trader in the spot DM interbank market for the period Monday, August 3, 1992 - Friday, August 7, 1992.

Source: Richard K. Lyons, "Tests of Microstructural Hypotheses in the Foreign Exchange Market," Journal of Financial Economics 39 (1995): 321-51.

Fig3.5a

**Net Trading Positions, August 3 - August 7, 1992
(in US\$ Millions)**

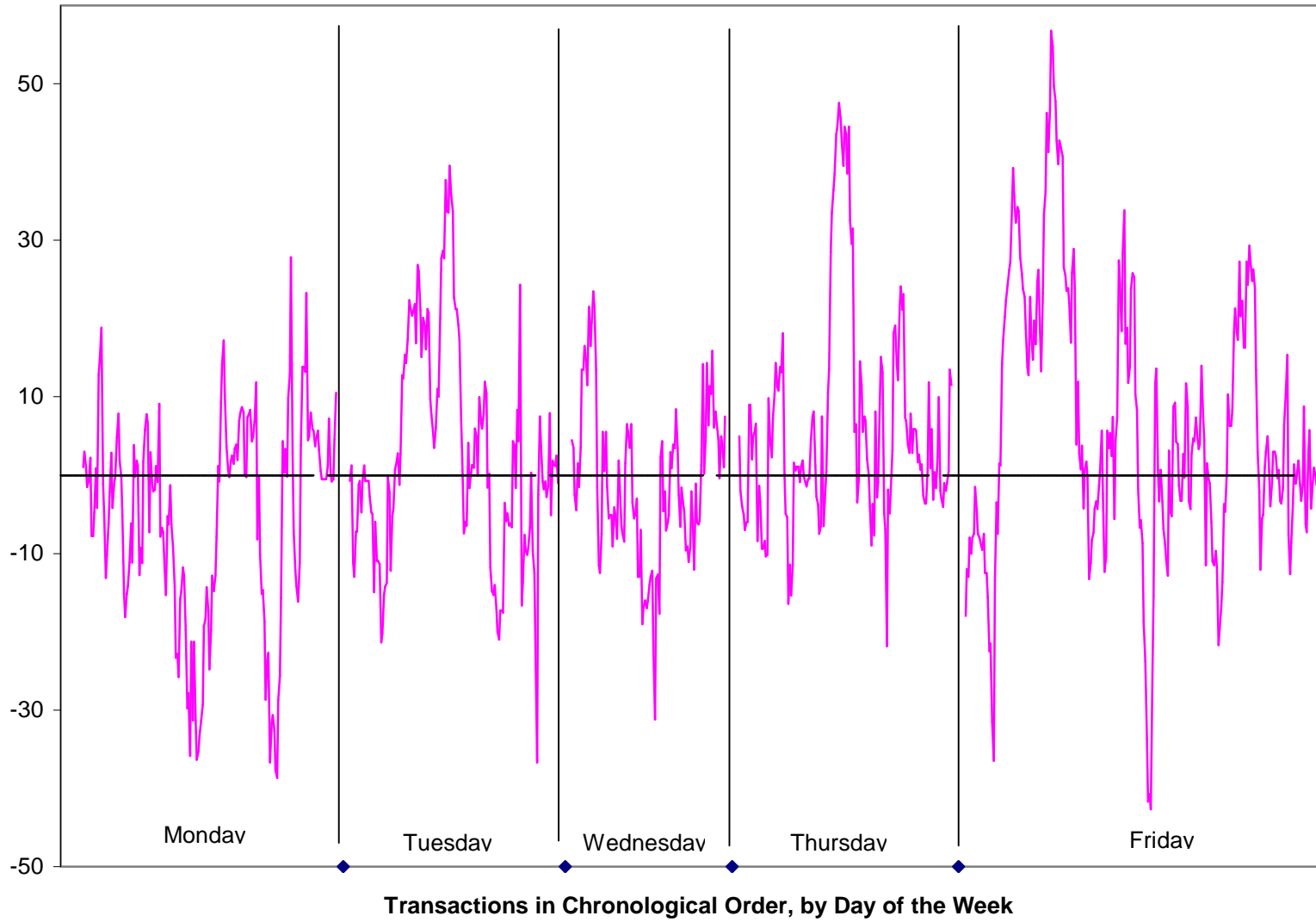
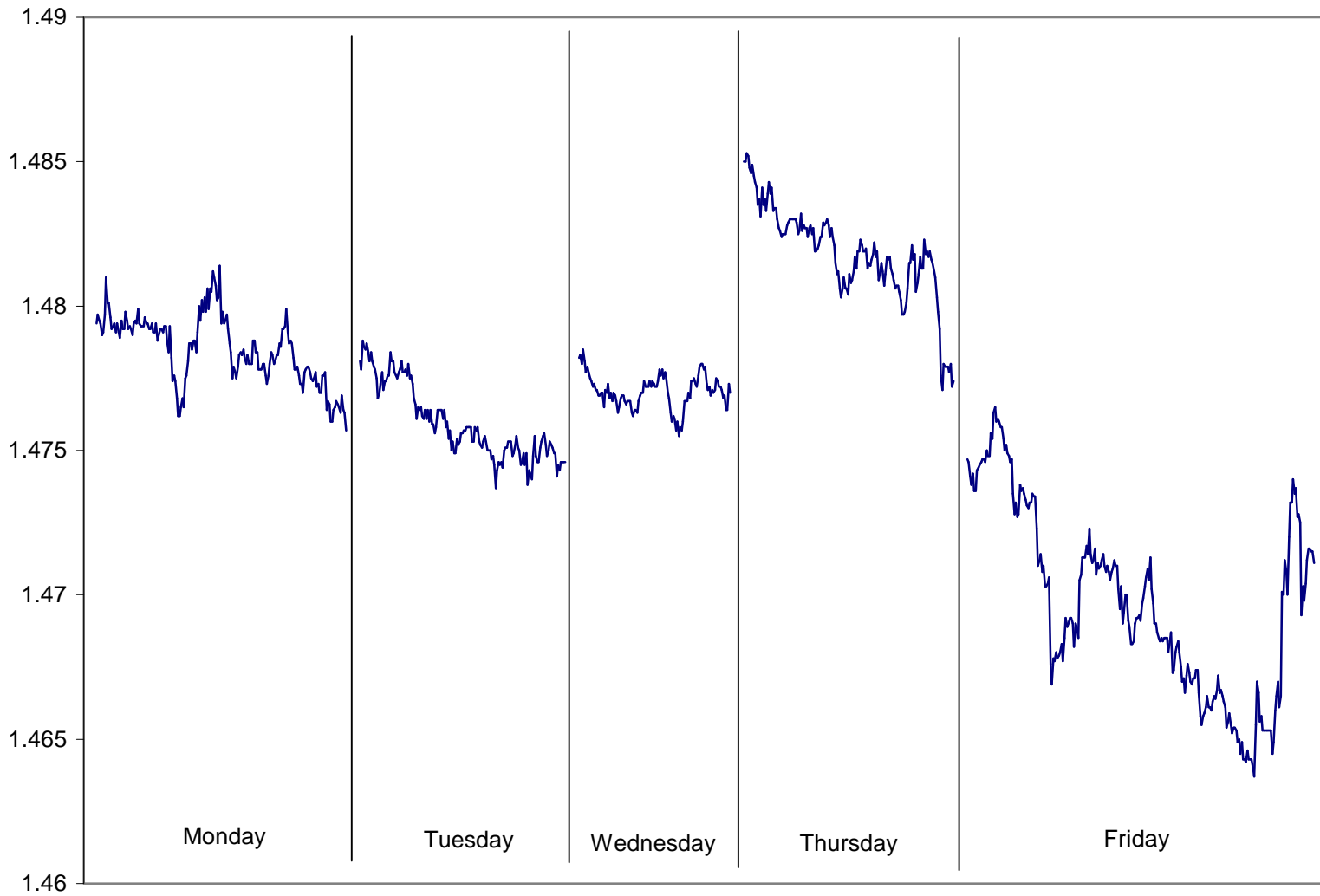


Fig3.5b

Transaction Prices: DM/US\$ on August 3 - August 7, 1992



Transactions in Chronological Order, by Day of the Week

Stylized Findings of a Commercial Bank US\$/DM Dealer¹

Quoting Behavior

- Little evidence of "quote shading" as a tool for inventory control in interbank trades
- *Quote shading*: Raising quotes when dealer is below the desired inventory level and lowering quotes when above the desired inventory level.
- Dealer does not want to give away information about his position to other interbank dealers

Inventory Control

- Dealer regains desired inventory level *quickly* (within 5-6 minutes) by actively initiating (outgoing) trades at other dealers quotes.
- Interbank FX market lacks *transparency*. Other dealers in the interbank market are unaware of a dealer's (bi-lateral) customer trades, until after the dealer has rebalanced his inventory position.
- *Inventory positions* vary substantially throughout the day, but the end-of-day positions uniformly return close to zero (a square-book).

¹ Based on a study of all transactions executed by a US\$/DM commercial bank dealer (with interbank and customer transactions) over a 25 day period in late 1995. Source: Jian Yao, "Essays on Market Making in the Interbank Foreign Exchange Market," unpublished Ph.D. dissertation, New York University, August 1997.

Stylized Findings of a Commercial Bank US\$/DM Dealer - continued

Sources of FX Dealer Profits

- Conventional wisdom - Dealer's profits result from speculative positioning
- Study findings

Type of Transaction	% of Trades	% of Trading Volume	% of Dealer's Profits
Customer Trades	4.3 %	13.0 %	75.9 %
Liquidity Providing ^a	6.8 %	13.2 %	-4.4 %
Speculative ^b	6.3 %	4.2 %	28.5 % (residual)
Other Transactions ^c	82.6%	69.6%	zero, by assumption

- Notes:
- a Liquidity providing trades are passive (incoming) trades that the dealer fills. (Only Reuters incoming trades in this study.)
 - b A speculative transaction is defined here as an active (outgoing) trade that increases the dealer's exposure (long or short), where the trade is not followed by an anticipated incoming (and offsetting) order.
 - c Includes voice and electronic brokers, other direct dealing, internal bank orders, IMM transactions, and miscellaneous
- Profits from customer trades are primarily related to a larger bid-ask spread.
 - Profits from customer trades are positively and significantly related to (daily) exchange rate volatility.

Classification of Dealer Trades

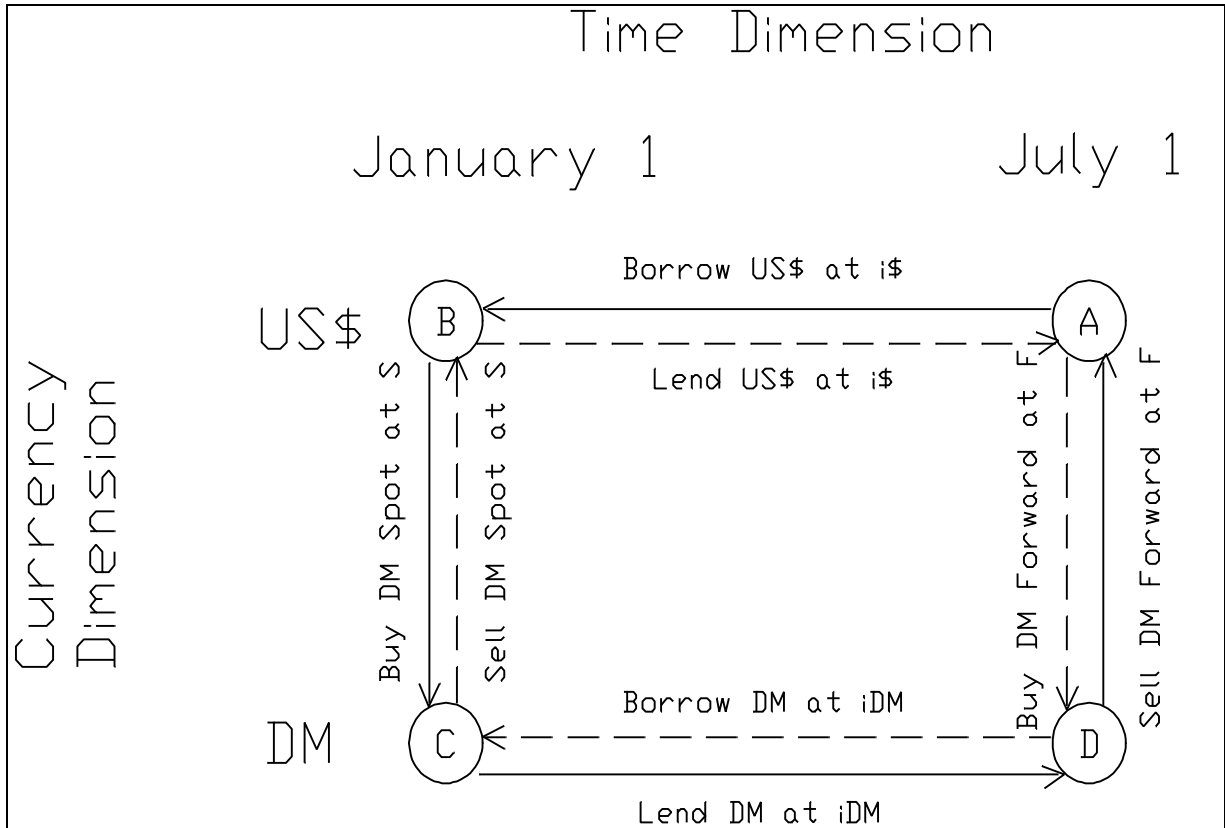
- Conventional Wisdom - Dealer's engage in speculation that ultimately results in high volatility in the FX market
- Study Findings -
 - Only a small percentage of dealer trades are speculative in nature
 - The large volume of interbank transactions is primarily related to rebalancing of dealer positions to obtain desired inventory levels, so-called "Hot-Potato Trading"

FOREIGN EXCHANGE TRADING RISKS AND CONTROL MEASURES

<u>TYPE OF RISK</u>	<u>CAUSED BY</u>	<u>CONTROLLED BY</u>
1. Exchange rate risk	Unexpected spot rate changes	Limiting open currency positions: trader limits daytime limits overnight limits overall currency limits
2. Interest rate risk	Unexpected forward rate changes	Limiting open forward positions: forward currency limits maturity limits gap limits
3. Credit risks		
• Rate risk	Default on foreign exchange contract (e.g. because of bankruptcy)	Customer trading limits Customer maturity limits Portfolio diversification
• Delivery risk	Default on foreign exchange contract after our bank has effected delivery of funds (e.g. because of time zone differences)	Matching delivery time zones Spreading delivery time dates Pre-payment ⇒ Keep central banks open longer ⇒ Establish new <i>pmt v. pmt</i> banks (Clearing Link Settlement Bank)
4. Country risk	Unexpected exchange controls or taxes	Country limits Portfolio diversification

Figure 3.2

The Relationship Between Spot and Forward Exchange Rates



Note:

A forward purchase of DM (equivalent to a forward sale of US\$) is shown by the arrow AD. This outright forward contract can be replicated by borrowing US\$ (arrow AB), buying DM in the spot market (arrow BC), and lending the DM (arrow CD). The borrowing and lending are carried out as a single transaction – a foreign exchange swap. The maturity of the forward contracts is identical to the maturity of the borrowing and lending contracts. A forward sale of DM can be described by reversing the direction of the arrows.

Using Figure 3.2: Constructing Outright Forward Contracts

Forward Purchase of DM on January for Value on July 1

Line segment AD (price F, forward rate \$/DM)

Can be replicated by:

Borrowing \$, line segment AB (price $i_{\$}$)
Buying DM spot, line segment BC (price S)
Lending DM, line segment CD (price i_{DM})

Forward Sale of DM on January 1 for Value on July 1

Line segment DA (price F)

Can be replicated by:

Borrowing DM, line segment DC (price i_{DM})
Selling DM spot, line segment CB (price S)
Lending \$, line segment BA (price $i_{\$}$)

Implication

In the absence of transaction costs, price of forward contract = price of three replicating contracts.

$$F (\$/DM) = S (\$/DM) \frac{(1 + i_{\$})}{(1 + i_{DM})}$$

Further Implications

Forward contracts are 'redundant'; that is, a forward contract can be replicated by a spot contract and a swap (a simultaneous borrowing and lending in the money market).

A corporation that uses an outright forward contract has a contingent, off-balance sheet liability. No cash changes hand so there is no direct effect on the firm's balance sheet. The forward contract uses part of the firm's scarce credit capacity at its bank.

A bank that constructs or hedges a forward position by using a 'spot and a swap' alters the asset and liability exposure of the bank. In other words, the trader's position must be funded.

1. INTEREST RATE PARITY EQUATION

When the forward rate takes on the value given in the equation we wrote above:

$$F (\$/DM) = S (\$/DM) \frac{(1 + i[\$])}{(1 + i[DM])}$$

we say that the forward rate is at its interest rate parity value.

Example:

Let $S = 0.50 \text{ \$/DM}$
 $i[\$, 6 \text{ months}] = 10\% \text{ per annum}$
 $i[DM, 6 \text{ months}] = 5\% \text{ per annum}$

$$F (\$/DM) = 0.50 (\$/DM) \times \frac{(1 + .10/2)}{(1 + .05/2)} = 0.5122 \text{ \$/DM}$$

Note: The interest rates used to compute the forward rate must be for the same maturity as the forward rate.

BOX 3.2

EXAMPLE OF REUTERS SCREEN PAGE
CITIBANK LONG-DATED FORWARD RATES
February 22, 1985

0949 CITIBANK	N.Y.	LONG	DATED	F.X.	212	207-3142 TX	66184 CILD
	1 YEAR	2 YEAR	3 YEAR	4 YEAR	5 YEAR	10 YEAR	
STG	215/200	200/125	-100/+100	-50/+300	-50/+350	-20/+10	
SF	1300/1250	2900/2600	4600/4100	5950/5550	7150/6550		
DM	1250/1230	2700/2500	4200/3900	5300/4900	6400/5900	102/90	
JY	1040/1010	2250/2050	3300/3000	4400/4000	5400/5000	101/89	
FFR	1225/1375	1800/2400	2200/3500	2600/4600	3000/5000		
HFL	1120/1090	2400/2200	3600/3200	4700/4200	5800/5200		
BFC	66/76	20/110	-20/-130	-60/+150	-220/+170		
BFF	49/59	10/80	-50/+90	-100/+110	-170/+110		
CAN	210/240	225/275	225/300	225/300	225/300	150/450	

FEB 22, FRIDAY MORNING INDICATIONS ONLY S2-K2-2 REUTER MONITOR 1216

The entries on the sample Reuters page (above) are "swap points". To determine the outright forward rates, the swap points are added to the spot rates (bid and ask) if the swap points are in a rising sequence, the swap points are subtracted from the spot rates (bid and ask) if the swap points are in a falling sequence. For example:

DM:	1 Year	5 Year
Spot rates (DM/\$)	3.3400/3.3420	3.3400/3.3420
Swap points	.1250/ .1230	.6400/ .5900
Outright forward rate	3.2150/3.2190	2.7000/2.7520

Bid/Ask spread ~ 0.12% ~ 1.93%
 % Forward premium ~ 3.68% ~18.38% (3.43% /year)
 $\equiv (F-S)/S$

FFR:	1 Year	5 Year
Spot rates (FFR/\$)	10.4000/10.4020	10.4000/10.4020
Swap points	.1225/ .1375	.3000/ .5000
Outright forward rate	10.5225/10.5395	10.7000/10.9020

Bid/Ask spread ~ 0.16% ~ 1.89%
 % Forward premium ~ 1.26% ~ 3.86% (0.76% /year)
 $\equiv (F-S)/S$

INTEREST PARITY AND SYNTHETIC SECURITIES

1. SYNTHETIC FORWARD CONTRACTS

$$F = S \frac{(1 + i_{\$})}{(1 + i_{DM})}$$

2. SWAP-DRIVEN US\$ SECURITIES

$$(1 + i_{\$}) = \frac{F}{S} (1 + i_{DM})$$

3. SYNTHETIC DM SECURITIES

$$(1 + i_{DM}) = \frac{S}{F} (1 + i_{\$})$$

Synthetic DM Commercial Paper A Numerical Example

ASSETS	LIABILITIES
<p>(1) Receive \$ Cash</p> <p style="padding-left: 40px;"><i>\$100,000,000</i></p> <p>(2) Spot transaction @ \$0.60/DM</p> <p style="padding-left: 40px;">Sell \$ Cash Buy DM Cash</p> <p style="padding-left: 80px;">- \$ 100,000,000 + DM 166,666,667</p> <p>(3) Forward Contract</p> <p style="padding-left: 40px;">A/R Buy \$, 180 day delivery @ \$0.606/DM</p> <p style="padding-left: 40px;"><i>\$102,500,000</i></p>	<p>(1) A/P</p> <p style="padding-left: 40px;">Issue \$ Commercial Paper 180 day maturity</p> <p style="padding-left: 40px;"><i>\$100,000,000 at 5% p.a.</i></p> <p>(3) Forward Contract</p> <p style="padding-left: 40px;">A/P Sell DM, 180 day delivery</p> <p style="padding-left: 40px;"><i>DM 169,141,914</i></p>

- (1) Sale of US\$ Commercial Paper +
- (2) Sale of \$ cash for DM cash +
- (3) Sale of DM forward

Replicates

- (4) Sale of DM Commercial Paper at an implied cost of:

$$DM\ 169,141,914 / DM\ 166,666,667 = 1.01485 \Rightarrow 2.97\% \text{ p.a.}$$