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International Economics

IX. Exchange Rates and International Finance

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IX. Exchange Rates and International Finance

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1. Exchange Rate Risk

Definition

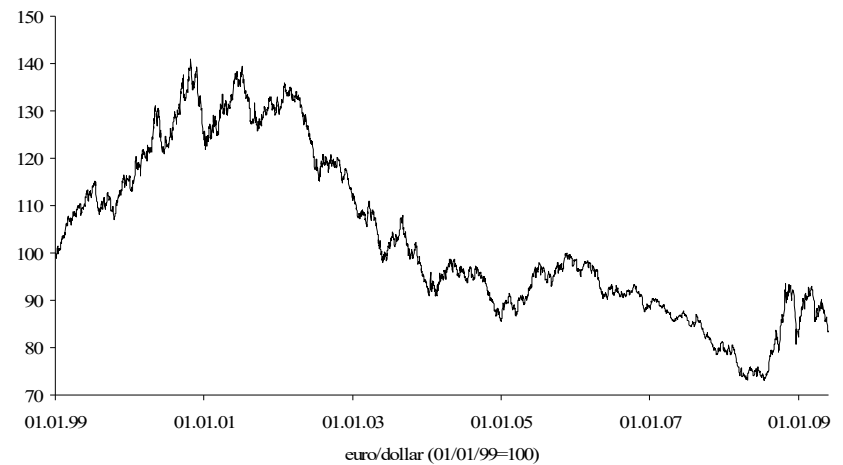
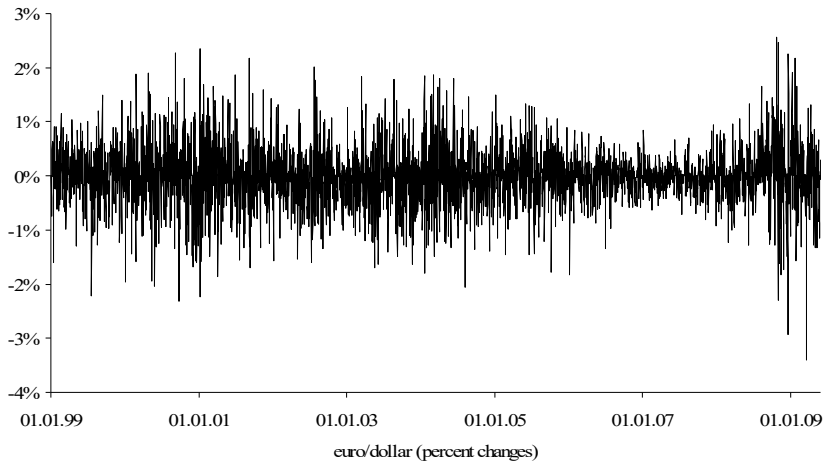
- Risk from unforeseen changes in exchange rates
- Constant risk in international trade and capital flows

Example

- German investors invest in the UK, and the pound sterling depreciates
- Return on investment in the UK is now worth less in terms of euros



Dollar Euro Exchange Rates 1999-2009



- The euro-dollar foreign exchange market is one of the “deepest” markets. Even here we see constant fluctuations
- Fluctuations of even 1-2 percent can impose great costs



A Modern Phenomenon

- Unknown under the gold standard
- Gold anchored exchange rate fluctuations
- Modern fiat currencies have no common anchor, by their nature they will fluctuate greatly, causing exchange rate risk

Causes

- Political changes
 - Esp. monetary policy
- Economic changes
 - Changes in the flows of trade and investment



Purchasing Power Parity Changes

- Changes in the data of the market lead to changes in the exchange rate
 - Changes in relative prices in two countries
- If demand for the products of a country increases, demand for its currency also increases
 - If tastes change and French wine is more highly sought after, French francs (now euros) will appreciate
- If new inventions make industry in a country more productive, the increase in output will lead to an appreciation of the currency

Fluctuations

- Short-term fluctuations in the balance of payments lead to fluctuations in exchange rates
 - Only temporary, equilibrating
 - Absent gold flows, only the exchange rates of currencies can adjust to the changes
- These exchange rate changes all impose currency risk



Economic Policies in General

- Policies that free markets and make it more profitable to invest lead to greater productivity
 - → greater demand for money → money appreciates
- Policies that restrict markets reduce productivity and reduce the attractiveness of investment
 - → lower demand for money → depreciation

Monetary Policy

- Increasing the money supply will lead to depreciation
- Decreasing the money supply to appreciation
- Changes in monetary policy – e.g., an increase in the rate of growth of the money supply – will cause unforeseen fluctuations in exchange rates



2. Forward Exchange – Hedging and Speculation

Responses to Exchange Rate Risk

- A desire to *hedge*, i.e., to reduce personal exchange rate risk
- A desire to *speculate*, i.e., to profit from exchange rate risk

Consequences

- Hedging reduces *personal* risk
- Speculation reduces *systemic* risk
- Both hedging and speculation take place in the market for *forward exchange*



Forward Foreign Exchange Contract

- An agreement to exchange one currency for another on some future date at a price set now (the *forward exchange rate*)
- Do not confuse the forward rate with the future spot price!
- Common dates for future exchange are 30, 90, and 180 days

The forward foreign exchange market

- Convenient for large customers, typically corporations
 - Viewed by their banks as acceptable credit risks
- Customers may have to pledge a margin to the bank
 - Security in the event of failure to perform
 - The margin is only a fraction of the contract



Example: an American wants to buy British pound sterling

- He agrees with his bank to buy £100,000 at the forward rate of \$1.3575/£ 90 days from now
- He will on the future date deliver \$135,750 in bank deposits and receive £100,000
- The agreed exchange will take place in the future on these terms, *regardless of what the future spot price is*

An opposite trade

- A customer agrees now to sell £100,000 90 days in the future at the forward rate \$1.3575/£ or £0.7366/\$
 - The bank can be a pure intermediary, or it can sell and buy forward exchange on its own account
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Definition

- Acquiring an asset in a foreign currency to offset a net liability position already held
- Or acquiring a liability to offset a net asset already held
- In financial jargon, hedging means reducing both kinds of “open” positions in a foreign currency:
 - *Long* positions (holding net assets in a foreign currency)
 - *Short* positions (holding net liabilities in a foreign currency)

Purpose

- It allows people to trade while minimizing exchange rate risk
 - It saves on the time and cost of keeping up with fast-changing international currency markets
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- Entering a forward exchange contract is a direct way to hedge

Example

- An American company has bought commodities in the UK and will have to pay £100,000 three months from now
- This represents a net pound liability. The company is exposed to exchange rate risk
- It can hedge its risk exposure by entering into a forward contract to acquire £100,000 90 days from now at the current forward rate of \$1.3575/£
- Now the company has a pound asset that exactly offsets its liability
 - Foreign exchange risk is eliminated

Alternative Hedges

- Sell merchandise in the UK payable 90 days from now
- Buy pounds in the spot market and invest, earning interest for 90 days
- Hedging a net foreign asset takes place similarly: by acquiring an offsetting foreign liability



- Hedging (and speculation) leads to a market for foreign exchange very similar to the one under the gold standard
 - Then: transport costs and interest foregone led to market in foreign assets and liabilities
 - Now: currency risk is the key driver of such markets

Modern Functions of Exchange Rates

- Exchange rates perform similar functions now to gold flows then:
- It is not always possible to completely offset net long or short positions – in that case, exchange rates must change
- Appreciation results if demand for assets high
- Depreciation when it is low



Causes of Speculation

- Speculators attempt to profit from better foreseeing the future evolution of exchange rates
 - Any position in the market carries a speculative element
 - The speculator always thinks he can do better than the market – if he's right, he profits

The Forward Foreign Exchange Market

- The forward foreign exchange rate is set by the supply and demand for currency in the future
- It is a market formed by speculative anticipations of future demand for currency



Setting Up the Trade

- Suppose that you believe the exchange rate of the pound sterling will fall from its current spot price of $\$1.36/\pounds$ in the near future
- You enter an agreement with your bank to sell $\pounds 10$ million in 90 days at the forward rate of $\$1.3575/\pounds$
 - The bank may or may not require you to post margin

Executing the Trade

- In 90 days, you enter the foreign exchange spot market and buy $\pounds 10$ million
- Profit or loss now depends on whether you were correct
- Suppose the pound has fallen to $\$1.20$
 - You buy $\pounds 10$ million for $\$12$ million
 - And sell the pounds to your bank at $\$1.3575/\pounds$ for a net profit of $\$1.575$ million
- Suppose instead the pound has risen to $\$1.40$
 - You now have to pay $\$14$ million in the spot market
 - But you have to sell pounds to the bank for $\$1.3575/\pounds$. Result: loss of $\$425,000$



- Speculation on appreciation is similar
 - You enter a contract to buy pounds at the forward rate in the hope that you can sell them in the future at a higher spot rate

Speculation is Derivative

- Speculation does not drive the market
- Trade and capital flows drive the market
- Speculation speeds up the discovery process of prices
- Foreign exchange speculators help establishing the correct exchange rate



Currency Futures Contract

- You lock in the price at which you buy or sell foreign exchange at a set date in the future
- Like forward contracts, but standardized and tradeable on organized exchanges
- Margin is required and profits and losses are realized daily (marked-to-market)

Currency Option

- you acquire the right to buy or sell foreign exchange at a price set today (the *strike price*) some time in the future
 - You pay a premium for this right, but this premium is the extend of your possible losses
 - If the spot price moves against you, you simply let the option expire without exercising it
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Currency Swap

- two parties agree to exchange flows of different currencies during a specified period of time
- It's a way to easily structure a series of forward and future contracts in a way that reduces cost and counter-party risk
- Why use swaps? One reason is to borrow abroad

Example

- Microsoft sells bond in the European market for euros – it borrows euros
- The company then enters a swap contract with its bank
 - Exchanging a large sum of euros for dollars now
 - Agreeing to paying interest in dollars and receiving interest in euros
 - At the end of the swap the principal sums will again be exchanged
- Microsoft can borrow abroad and only have expenses in dollars, as the euro payments from the swap pay the interest on the bonds



3. Forward Exchange and International Investment

Exchange Rate Risk and Capital Flows

- Forward exchange is an important part of international financial markets
- *Covered international investment* is hedged against exchange rate risk in some way
- *Uncovered international investment* is not hedged, that is
 - There is a speculative element to the international position
 - In addition to the speculative element in the investment itself

It's an entrepreneurial decision whether to cover against exchange risk



General Form of Covered Investment

- First, the investor buys foreign currency at spot rate e
- Second, he invests in foreign-currency denominated bond (or other foreign asset) and earn interest i_f
- Third, he sell foreign currency forward at the current forward rate f
- The investor's profit isolated
 - Only from the interest he earns abroad
 - (And his risk only from the fluctuation in the interest rate)



- At maturity of the investment, the investor will have $(1 + i_f) \times f/e$ in domestic currency

The Forward Premium

- We can approximate covered return with the help of the *forward premium*, F
 - $F = (f - e) / e$
- If F is negative, it means that the currency is at a forward *discount*, that is, the forward rate is below the spot exchange rate
- Covered return will be equal to $F + i_f$
- If $F = 0$, it means that there is no (expected) change in exchange rates, i.e., the spot rate equals the forward rate

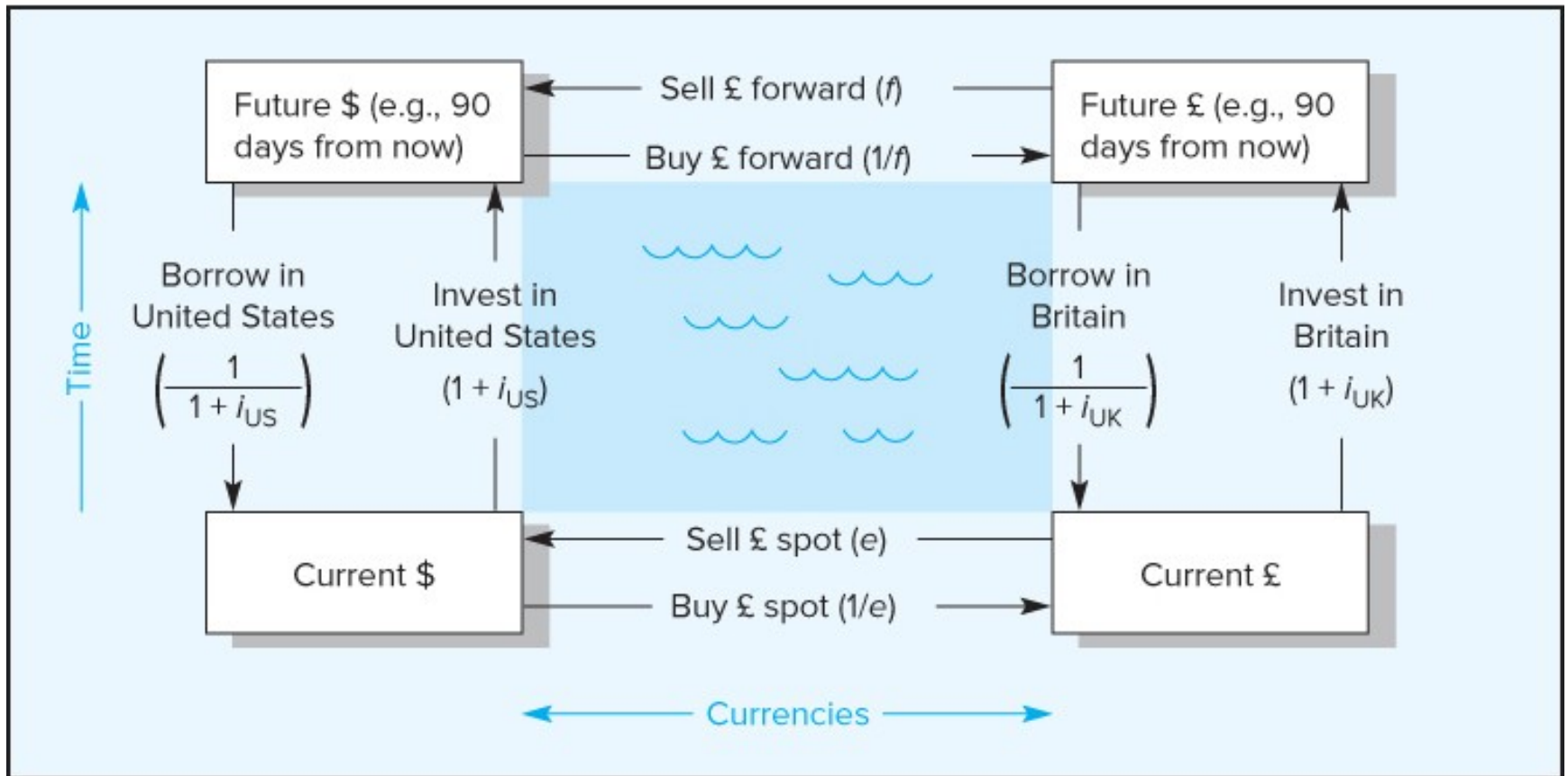


- The *covered interest differential* is the difference between the overall covered international investment return and the domestic return
 - $\mathbf{CD} = (1 + i_f) \times f/e - (1 + i_d)$
 - Where i_d is the domestic interest rate
 - It can also be approximated to: $\mathbf{CD} = (F + i_f) - i_d$
- If the covered interest differential is positive, one is better off investing abroad; if negative, at home



The “Lake” Diagram

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- The lake diagram shows ways of investing as paths around a lake
 - It allows us to compare domestic investment and international covered investment
 - You can get from any one corner of the lake to any other
 - If you move from left to right you sell dollars and buy pounds
 - Movement right to left means you buy dollars and sell pounds
 - Movement upward means investment or lending
 - Movement downward means dis-investment or borrowing
 - The choice of the more profitable route from one corner to the other depends on the covered interest differential
 - Example: we set out with present dollars wanting future dollars
 - If CD is positive it's more profitable to go the long way around the lake and “visit” Britain
 - Buy pounds spot, invest in UK, and sell pounds forward for dollars
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Covered interest arbitrage: buying currency spot and selling it forward

- Essentially risk-less, but ties up assets
- The arbitrage works as follows: UK interest rates i_{uk} are 4 percent, US interest rates i_{us} are 3 percent, both spot and forward rates are \$2.00/£ so **F = 0**
- This means **CD = 0.1**. An arbitrageur sets up a movement around the lake:
 - He sells \$20 million in the spot market for £10 million, lends it out for 90 days at 4 percent and sells £10.4 million forward for \$20.8 million
 - He can then borrow against his future \$20.8 million at 3 percent, giving himself \$20,194,175 = 20.8 million/1.03 today
 - His gains are \$194,175 minus any fees he had to pay on his transactions



Covered Interest Parity

- Like with all arbitrage, speculators quickly eliminate the profit opportunity by buying and selling
- Rates adjust, driving the covered interest differential to zero, or parity

Covered interest parity: **CD = 0**

- Covered return on foreign-currency investment equals return on a comparable domestic-currency investment
- A currency is at a forward premium (discount) by as much as its interest rate is lower (higher) than the interest rate in the other country
- Covered interest parity links together four rates: spot and forward rates and foreign and domestic interest rates
- If one rate changes, then at least one other rate must also change to maintain parity



- The international investor is exposed to exchange rate risk
 - His return depends on the actual future spot exchange rate
- At the time of investment, the investor uses the *expected future spot rate* (e^{ex}) to calculate the expected return on uncovered foreign financial investment
 - This rate is simply what he personally expects the future spot rate to be – it's not an objective exchange rate

Reasons for Choosing Uncovered Investment

- The investor does not care much about risk exposure (risk neutral)
- The diversification of his portfolio indicates that uncovered investments add little to the overall riskiness of his portfolio
- He trusts to his own superior forecasting ability



The *expected uncovered interest differential* **EUD**

- The difference between the expected return on uncovered foreign investment and domestic return:

$$\mathbf{EUD} = (1 + i_f) \times e^{ex}/e - (1 + i_d)$$

- Note that the only difference from covered interest differential is that we substitute e^{ex} for f
- This makes sense, since its precisely the choice between forward exchange rate and future spot rate that distinguishes between covered and uncovered investment



Uncovered interest parity: expected differential equals zero (**EUD = 0**)

- Expected overall return on foreign-currency investment equals return on domestic-currency investment
- A currency is expected to appreciate (depreciate) by as much as its interest rate is lower (higher) than the rates in other countries
- Again, four rates are linked together: spot and future exchange rates, foreign and domestic interest rates
 - If one rate changes, then at least one of the other rates must also change to maintain uncovered interest parity



- Covered interest parity was first proposed by J. M. Keynes
- Uncovered interest parity was first proposed by Irving Fisher
- Do they hold? Empirical evidence suggests so, although it is hard to estimate expected future spot rates, since these are essentially subjective judgements
- Note however, that two essentially different markets are here linked together:
 - Currency markets, where exchange rates are set by PPP
 - Time/capital/credit markets, where the interest rate is set by time preferences
- Short-term, the linkages hold, but long-term the determinants are different:
 - If there is an international capital market, interest rates will tend to equalize globally, in accordance with time preferences
 - Exchange rates will fluctuate according to changes in each currency's PPM and be set by the relative PPM of different currencies (PPP)
 - The movements in capital markets that link the four rates together simply reflects the fundamental determinants of trade and capital flows: changes in international demand, in productivity, in terms of trade etc.



4. Eurodollars and Eurocurrencies

Definition

- Dollars outside the jurisdiction of the US
- *Eurodollars* came into being after WW2 when dollars were deposited in European banks
- European banks create Eurodollar deposits by lending to market actors seeking dollars
 - Eurodollar deposits function exactly like domestic bank deposits: they form part of the supply of money (Friedman 1969; Machlup 1970)
 - Eurodollars therefore form part of the global dollar supply

Eurocurrencies

- Created like Eurodollars, that is, as deposits in another jurisdiction than the issuing government
- You even have Euro-euros!



The Reason for the Evolution of Eurodollars

- Europeans wanting a return on excess dollars
- Soviet Union wanting to hold its dollar holdings outside the US
- It also increasingly became a way for US banks to skirt bank regulations like reserve requirements
 - By transferring dollars to foreign subsidiaries, US banks could extend more credit
 - Getting around reserve requirements and the legal interest ceiling

Statistical Problems

- It's very difficult to get an overview of the extent of Eurodollar creation (and other Eurocurrencies); data is hard to come by. It's an important component in financing global trade
 - US FED records eurodollars as part of their money supply statistics, but it's ~~not clear that they capture everything~~
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5. Conclusion

1. Fluctuating exchange rates imposes exchange rate risk. This is an important factor in the growth of the global currency market
2. Forward exchange is a way for businessmen to hedge against exchange rate risk. It is also a means of speculating on changes in exchange rates
3. When investing internationally, investors must take account of both differences in interest rates and changing exchange rates. If the covered interest differential is other than zero, an opportunity for speculation emerges. However, long term, interest rates and exchange rates are determined according to different principles
4. Eurodollars and Eurocurrencies are an important but not well-studied area of international finance and trade



6. References

Friedman, Milton. 1969. The Euro-Dollar Market: Some First Principles. *The Morgan Guaranty Survey*, pp. 4-15.

Machlup, Fritz. 1970. Euro-Dollar Creation: A Mystery Story. *Banca Nazionale del Lavoro Quarterly Review* vol. 23 (94), pp. 219-260.