



Lecture 11

Exchange Rates and Open Economy

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Lecture Outline

- ▶ Exchange Rates
- ▶ Flexible Exchange Rates
 - ▶ Determination of Exchange Rate in The Long Run: Purchasing Power Parity Theory
 - ▶ Determination of Exchange Rate in The Short Run: Supply and Demand Analysis
- ▶ Fixed Exchange Rates



Exchange Rates

	EUR - EURO €	1	1.50.50	1	1.52.00		HKD - HONG KONG \$	100	18.10	\$1	5.38
	JPY - JAPAN ¥	1000	12.55...	1000	12.68		CNY - CHINA (RMB)	100	20.40	\$1	4.84
	AUD - AUSTRALIA \$	1	1.06.00	1	1.07.20		IDR - INDONESIA RUP	1000	10.40	\$1	9300
	CAD - CANADA \$	1	1.05.50	1	1.06.80		TWD - TAIWAN \$	100	4.20	\$1	21.60
	GBP - STERLING £££	1	1.77.50	1	1.79.50		THB - THAILAND BAHT	100	3.85	\$1	24.75
	CHF - SWISS FRANC	1	1.40.00	1	1.42.50		KRW -S. KOREA WON	1000	1.15	\$1	810
											
	MYR BUY (RM. 100)				32.10	MYR - SELL				3.08	
	SEK - SWEDISH KRONA	0.15.30	\$1	6.28		VET-VIETNAMESE DONG	10000	5.80	\$1	15500	
	NOK - NORWEGIAN KRONE	0.16.50	\$1	5.80		LKR -SRI LANKA RUPEES	100	9.00	\$1	100	
	DKK - DANISH KRONE	0.20.20	\$1	4.75		NPR -NEPAL RUPEES	100	1.20	\$1	72.00	
	NZD - NEW ZEALAND	1.00.20	\$1	1.01.90		PHP -PHILIPPINES PESO	100	2.83	\$1	34.00	
	TRY - TURKEY LIRA	0.42.00	TRY 1	48.50		ZAR SOUTH AFRICA RAND	100	9.20	\$1	9.00	
	SAR - SAUDI RIYAL	0.36.50	\$1	2.55		AED -UAE DIRHAM	1	0.36	\$1	2.00	
	RUB - RUSSIAN RUBLE	20.00..	\$1	43.50		MMK -MYANMAR KYAT	1000	1.00	\$1	8.00	

Nominal Exchange Rates

- ▶ The **nominal exchange rate** is the rate at which two currencies can be traded for each other

Rates for March 8, 2020	Foreign Currency / U.S. Dollar	U.S. Dollar / Foreign Currency
UK (£)	0.7665	1.3047
Canada (C\$)	1.3413	0.7455
Mexico (peso)	20.1091	0.0497
Japan (¥)	105.29	0.00950
China (¥)	6.9320	0.1443
European Union (€)	0.8861	1.1286

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Nominal Exchange Rates

- ▶ Consider 3 currencies: US\$, C\$, and £
 - ▶ One US\$ buys £ 0.7665 or C\$ 1.3413
 - ▶ The exchange rate between UK pounds and Canadian dollars can be calculated from this information

$$£ 0.7665 = \text{C\$ } 1.3413$$

$$£ 1 = \text{C\$ } 1.3413 / 0.7665$$

$$\mathbf{£ 1 = \text{C\$ } 1.7498}$$

OR

$$\text{C\$ } 1 = £ 0.7665 / 1.3413$$

$$\mathbf{\text{C\$ } 1 = £ 0.5715}$$

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U.S. Nominal Exchange Rate, 1973-2021



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Changes in Exchange Rates

- ▶ **Appreciation** is an increase in the value of a currency relative to other currencies
 - ▶ Example: U.S. dollar appreciates when it goes from $\text{US\$ } 1 = \text{£ } 0.5$ to $\text{US\$ } 1 = \text{£ } 0.6$
 - A dollar buys more of the foreign currency
- ▶ **Depreciation** is a decrease in the value of a currency relative to other currencies
 - ▶ Example: the Canadian dollar depreciates when it goes from $\text{C\$ } 1 = \text{¥ } 96$ to $\text{C\$ } 1 = \text{¥ } 95$
 - A Canadian dollar buys fewer yen

Exchange Rate Regime

- ▶ A **flexible exchange rate** is an exchange rate whose value is not officially fixed but varies according to the supply and demand for the currency in the foreign exchange market
- ▶ A **fixed exchange rate** is an exchange rate set by official government policy
 - ▶ Can be set independently or by agreement with a number of other governments
 - ▶ Fixed rates can be set relative to a major currency (e.g. US dollar or euro) or a basket of currencies

Real Exchange Rates

- ▶ In general, a country's ability to compete in international markets depends in part on the prices of its goods and services relative to the prices of foreign goods and services
- ▶ The **real exchange rate** is the price of the domestic good or service relative to the price of the foreign good or service, when prices are expressed in terms of a common currency
- ▶ Real exchange rate =
$$\frac{\text{Price of domestic good}}{\text{Price of foreign good, in domestic currency}}$$

Real Exchange Rates – An Example

- ▶ You are choosing between a U.S. computer and a comparable Japanese computer, based on price (home country is U.S.)
 - ▶ Price of US computer, $P = \text{US\$}2,400$
 - ▶ Price of Japanese computer, $P^f = \text{¥} 242,000$
 - ▶ e , nominal exchange rate, is the number of units of foreign currency per domestic currency
 - ▶ $e = \text{¥}110/\text{US\$}1$
 - ▶ **To convert a foreign price, P^f , to the US dollar price, divide P^f by e**
 - ▶ $P^f / e = \text{¥}242,000 / \text{¥}110/\text{US\$}1 = \$2,200$
 - ▶ The Japanese computer cost US\$2,200
 - ▶ The Japanese computer is cheaper

Real Exchange Rates – An Example

- ▶ Real exchange rate

$$= \frac{\text{Price of domestic good}}{\text{Price of foreign good, in US\$}} = \frac{P}{P^f/e} = \frac{eP}{P^f}$$

- ▶ Real exchange rate (for computers)

$$= \frac{\text{¥}110 \times \$2400}{\text{¥}242000} = \frac{\text{¥}264,000}{\text{¥}242,000} = 1.09$$

- ▶ The price of the U.S. computer relative to the price of the Japanese computer is 9% higher
- ▶ When the real exchange rate is high, domestic goods are more expensive than foreign goods
- ▶ Net exports tend to be low when the real exchange rate is high; the converse is true
- ▶ An increase in e increases the real exchange rate if P and P^f are constant

Strong Currency = Strong Economy?

- ▶ A strong currency does not necessarily imply a strong economy
 - ▶ Dollar was stronger in 1973 than in the 1990s
 - ▶ 1973 was a period of deep recession and rising inflation; US economy was strong in 1990s
- ▶ An appreciating currency tends to raise real exchange rate which may hurt a country's NX



Determination of Exchange Rate in the Long Run

Law of One Price

- ▶ **The law of one price** states that if transportation costs are relatively small, the price of an internationally traded commodity must be the same in all locations
- ▶ Suppose grain in Sydney was half the price of wheat in Mumbai
 - ▶ Buy grain in Sydney, increasing demand and price
 - ▶ Sell grain in Mumbai, increasing supply and decreasing the price
- ▶ International market for grain would return to equilibrium only when unexploited opportunities to profit had been eliminated

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Law of One Price – An Example

- ▶ A bushel of grain costs
 - ▶ A\$ 5 in Sydney and
 - ▶ Rs 150 in Mumbai
- ▶ For the price of the bushel of grain to be the same in both countries, Australian price of grain must equal the Indian price of grain
$$\text{A\$5} = \text{Rs150}$$
$$\text{A\$1} = \text{Rs30}$$
- ▶ The implied nominal exchange rate is A\$1 = Rs 30

Purchasing Power Parity (PPP)

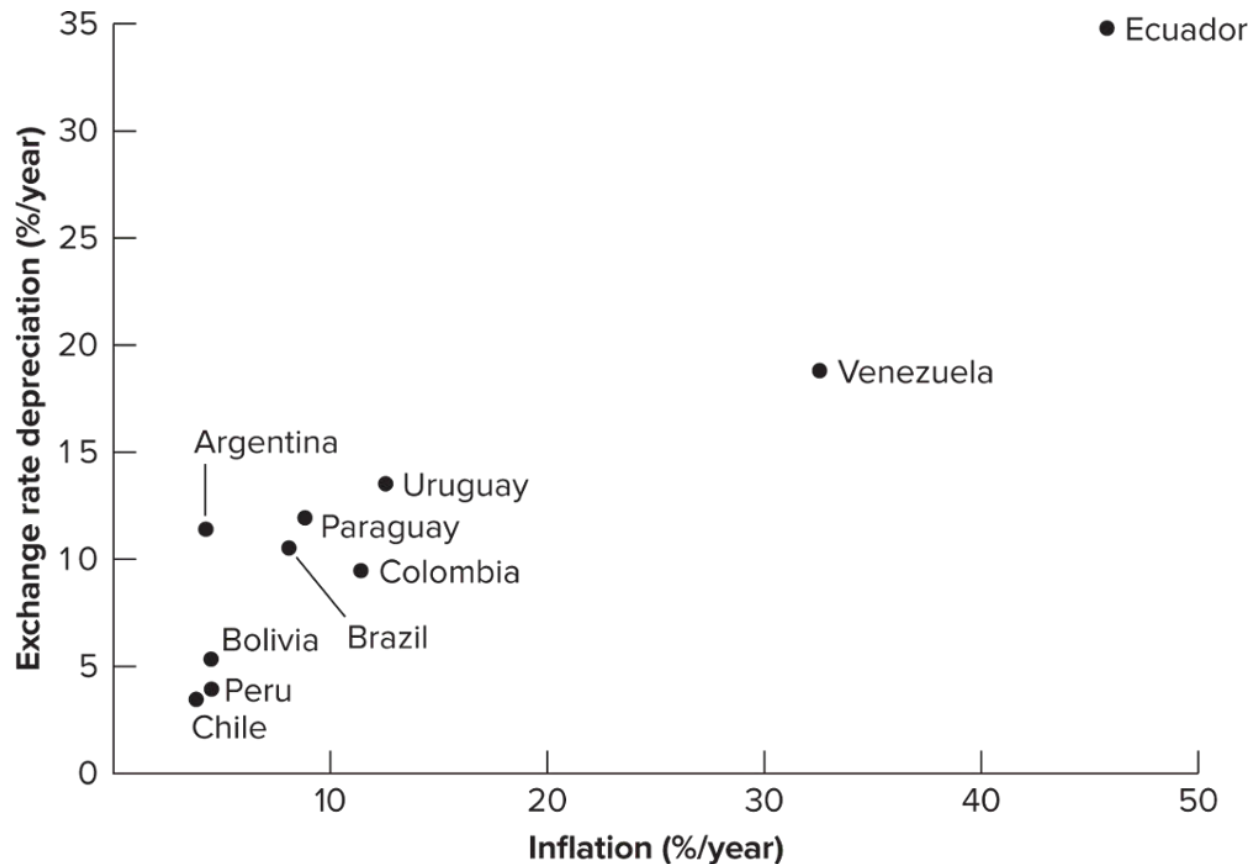
- ▶ **Purchasing power parity** is the theory that nominal exchange rates are determined as necessary for the law of one price to hold
- ▶ In the long run, the currencies of countries that experience significant inflation will tend to depreciate

PPP – An Example

- ▶ A bushel of grain costs
 - ▶ A\$ 5 in Sydney and
 - ▶ Rs 150 in Mumbai
 - ▶ Implied nominal exchange rate is $A\$ 1 = \text{Rs } 30$
- ▶ Suppose that India experiences inflation and the bushel of grain now costs Rs 300 in Mumbai
- ▶ For the law of one price to hold
$$A\$5 = \text{Rs}300$$
$$A\$1 = \text{Rs}60$$
- ▶ The Indian rupee depreciates to $A\$1 = \text{Rs } 60$

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Inflation and Currency Depreciation in South America, 1995-2004



Shortcomings of the PPP Theory

- ▶ PPP theory is useful for predicting changes in nominal exchange rates over the relatively long run
 - ▶ In the long run, the currencies of countries that experience significant inflation will tend to depreciate
- ▶ PPP theory doesn't work as well in the short run
 - ▶ Transportation costs limit international trade in many goods and services
 - ▶ Not all goods that are traded are standardized commodities

Determination of Exchange Rate in the Short Run



Foreign Exchange Market

- ▶ The **foreign exchange market** is the market on which currencies of various nations are traded
- ▶ Foreign exchange is the exchange of a pair of currencies
 - ▶ In the following example, we will be referring to the euro-dollar market
- ▶ There are many similar markets for every other pair of traded currencies

Supply of Dollars in Foreign Exchange Market

- ▶ Anyone who holds dollars is a potential supplier
 - ▶ US households and firms are the most common suppliers
- ▶ Why would a US household or firm want to supply dollars in exchange for euros?
 1. To purchase foreign goods or services
 2. To purchase foreign assets

Supply of Dollars in Foreign Exchange Market

- ▶ Supply curve has a positive slope
 - ▶ The more foreign currency each dollar can buy, the larger the quantity of dollars supplied
 - This makes foreign goods, services and assets cheaper
 - ▶ When $\$1 = \text{€}1$, a $\text{€}50$ item costs \$50
 - ▶ If $\$1 = \text{€}2$, that same $\text{€}50$ item costs \$25
 - ▶ When the dollar appreciates, the quantity of dollars supplied increases

Demand for Dollars in Foreign Exchange Market

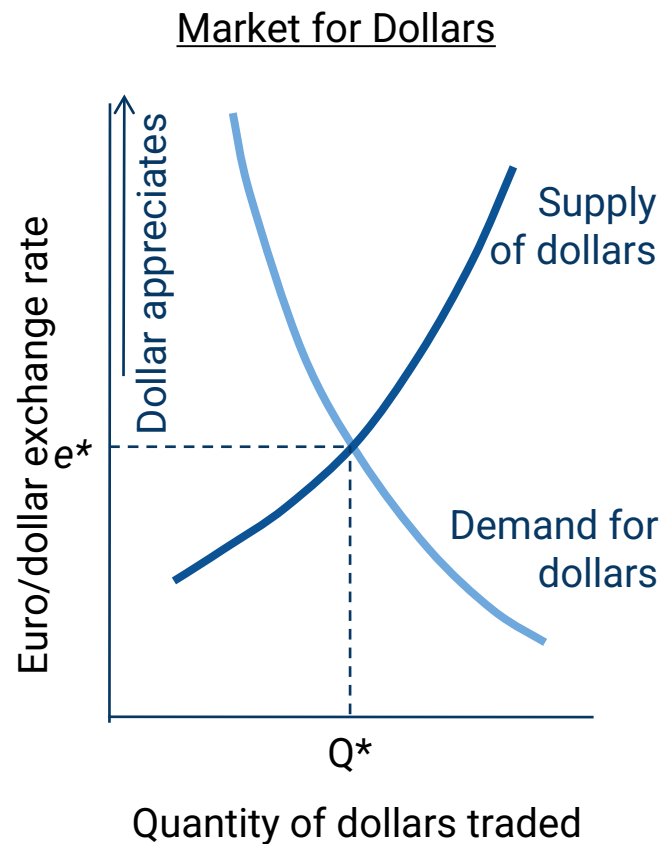
- ▶ Anyone who holds euro can demand dollars
 - ▶ Euro zone households and firms are the most common demanders
- ▶ Why would an euro zone household or firm want to purchase dollars in exchange for euros?
 1. To purchase U.S. goods or services
 2. To purchase U.S. assets

Demand for Dollars in Foreign Exchange Market

- ▶ Demand curve has a negative slope
 - ▶ The more foreign currency needed to buy a dollar, the smaller the quantity of dollars demanded
 - This makes U.S. goods more expensive
 - ▶ When $\$1 = €1$, a \$30 item costs €30
 - ▶ If $\$1 = €2$, that same \$30 item costs €60
 - ▶ When the dollar appreciates, the quantity of dollars demanded decreases

The Dollar–Euro Market

- ▶ The **market equilibrium value of the exchange rate** equates the quantities of the currency supplied and demanded in the foreign exchange market
- ▶ Dollar appreciates if e^* increases
- ▶ Dollar depreciates if e^* decreases



Supply of Dollars in Foreign Exchange Market

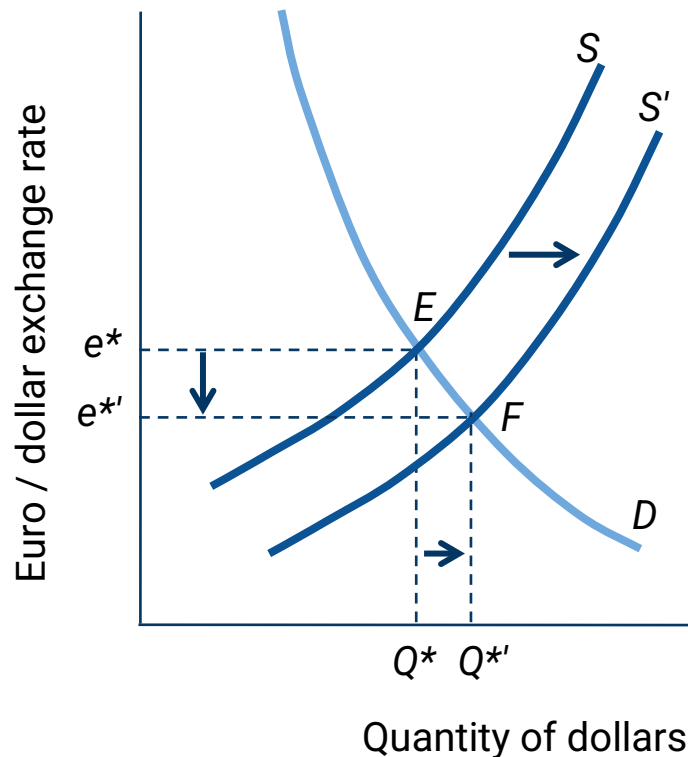
- ▶ Supply of dollars for euros is determined by
 - ▶ The preference for European goods
 - The stronger the preference, the greater the supply of dollars
 - ▶ U.S. real GDP
 - The higher GDP, the greater the supply of dollars
 - ▶ Real interest rate on European assets and the real interest rate on U.S. assets
 - Supply of dollars will be greater if
 - Real interest rate on European assets is higher
 - Real interest rate on U.S. assets is lower

Demand for Dollars in Foreign Exchange Market

- ▶ Demand for dollars by holders of euro is determined by
 - ▶ The preference for US goods
 - The stronger the preference, the greater the demand for dollars
 - ▶ Real GDP in Europe
 - The higher GDP, the greater the demand for dollars
 - ▶ Real interest rate on European assets and real interest rate on U.S. assets
 - Demand of dollars will be greater if
 - Real interest rate on European assets is lower
 - Real interest rate on U.S. assets is higher

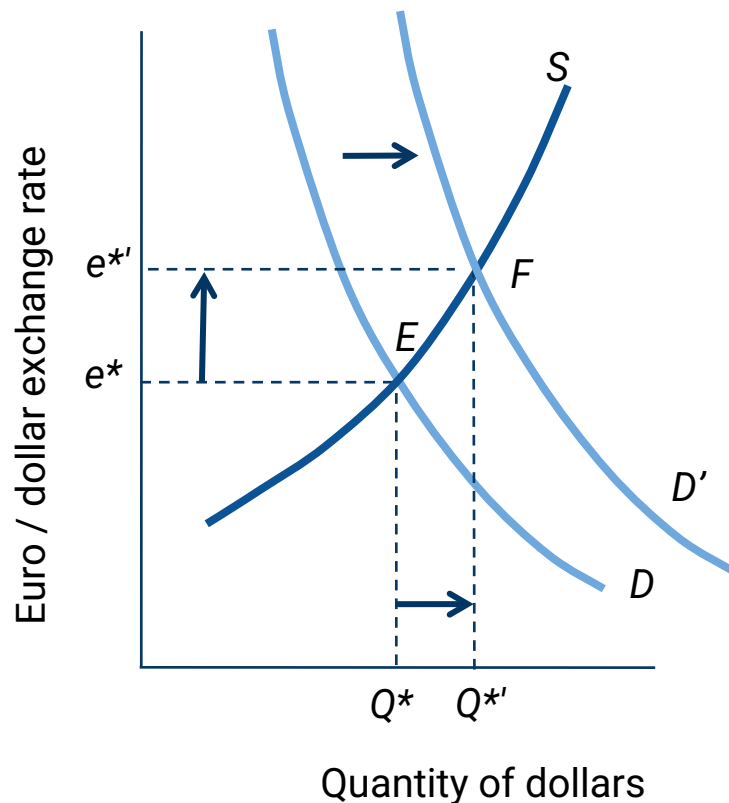
An Increase in the Supply of Dollars

- ▶ Initial equilibrium at E
- ▶ Suppose consumers prefer the new washing machines made in Germany
 - ▶ Shift in preferences
- ▶ Increase in the supply of dollars shifts dollar supply curve to the right
 - ▶ New equilibrium at F
- ▶ Dollar depreciates to $e^{*'}$
- ▶ Quantity of dollars traded increases to $Q^{*'}$



Tightening of Monetary Policy Strengthens the Dollar

- ▶ Higher real interest rates in U.S. increase demand for dollars
- ▶ Dollar appreciates
- ▶ More dollars are traded



Monetary Policy and the Exchange Rate

- ▶ Monetary policy was the main cause of recent changes in the dollar exchange rate
 - ▶ Dollar appreciation in the early 1980s
 - Real interest rate rose from negative values in 1979 and 1980 to over 7% in 1983 and 1984
 - ▶ Dollar depreciation 2002-2004
 - U.S. economy was in recession during 2001
 - Significant expansion in monetary policy starting in 2001; Fed funds rate went from 6% in 2001 to 1% in 2003
 - Demand for U.S. assets decreased

- ▶ Flexible exchange rates make monetary policy more effective
 - ▶ When the Fed tightens monetary policy, it sets off a chain of domestic events



- ▶ And a chain of international events



- ▶ Monetary policy is more effective in an open economy with flexible exchange rates

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Fixed Exchange Rates

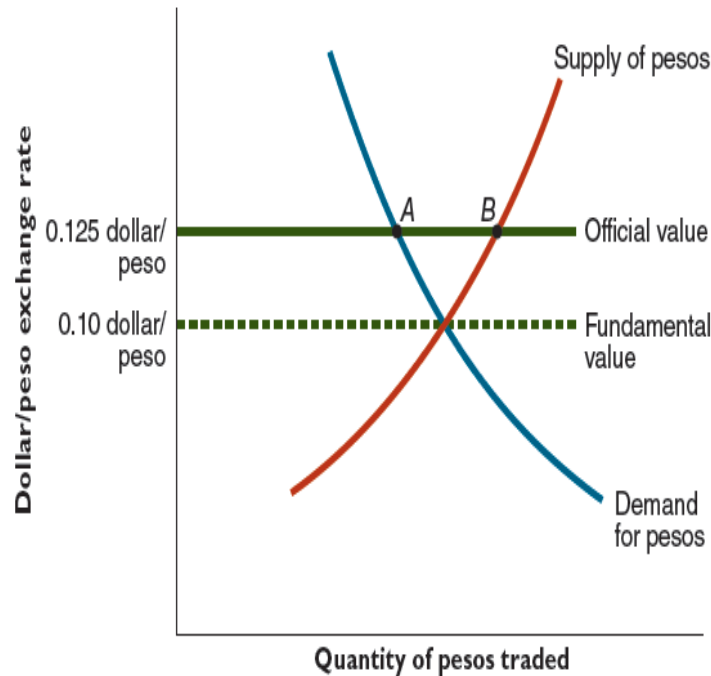
- ▶ Most large industrial countries use a flexible exchange rate
- ▶ Small and developing countries may use a fixed exchange rate
- ▶ Main advantages:
 - ▶ Predictability and stability in foreign transactions
 - ▶ Certainty of future value of the currencies
- ▶ Main disadvantages:
 - ▶ Expensive to maintain (need sizable foreign exchange reserves)
 - ▶ May be vulnerable to speculative attack

Fixed Exchange Rates

- ▶ To establish a fixed exchange rate system, the government states the value of its currency in terms of a major currency or a basket of currencies
- ▶ Government attempts to maintain the fixed exchange rate at its existing level
- ▶ Sometimes the government may have to change the value of the exchange rate
 - ▶ **Devaluation** is a reduction in the official value of a currency
 - ▶ **Revaluation** is an increase in the official value of a currency

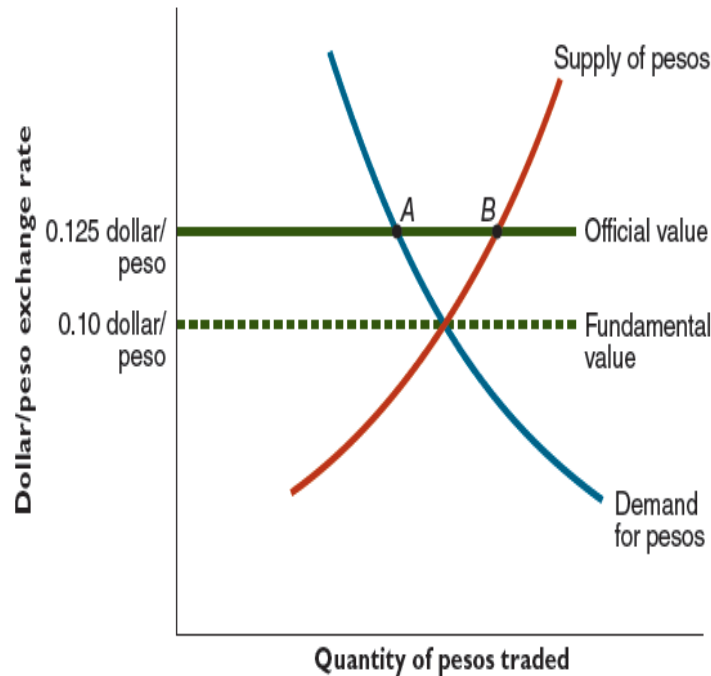
Official vs Fundamental Value

- ▶ The exchange rate fixed by the government may be higher or lower than the **fundamental value**
- ▶ Equilibrium exchange rate that equates the quantities of currency supplied and demanded in the foreign exchange market



Overvalued Exchange Rate

- ▶ Responses to an overvalued currency
 - Devalue the currency
 - Impose trade barriers and restrict purchase of foreign assets
 - Purchase the currency

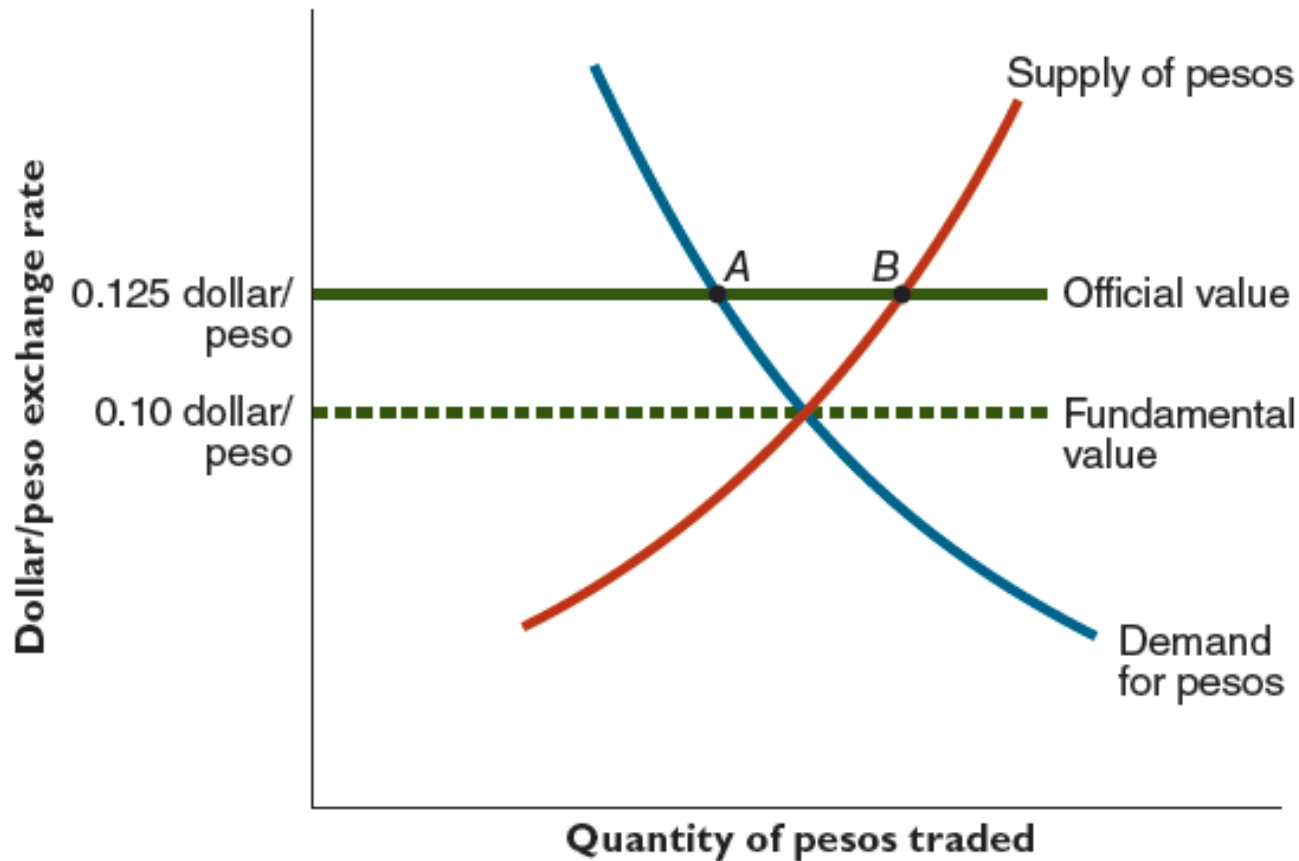


Overvalued Exchange Rate – An Example

- ▶ Latinian peso in the foreign exchange market:
 - ▶ Demand = $25,000 - 50,000e$
 - ▶ Supply = $17,600 + 24,000e$
 - ▶ Fundamental value:
 - ▶ $25,000 - 50,000e = 17,600 + 24,000e$
 - ▶ Solving for e :
 - ▶ $7,400 = 74,000e$
 - ▶ $e = 0.10$
- ▶ Official value of the peso = 0.125 dollars
 - ▶ $D = 25,000 - 50,000(0.125) = 18,750$
 - ▶ $S = 17,600 + 24,000(0.125) = 20,600$
 - ▶ Excess supply = 1,850 pesos

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Overvalued Exchange Rate



Overvalued Exchange Rate – An Example

- ▶ To maintain the fixed rate, the Latinian government must purchase 1,850 pesos per period at the cost of $(1,850 \text{ pesos} \times 0.125 \text{ dollars/peso}) = \231.25
- ▶ To purchase its own currency and maintain an overvalued exchange rate, a country must hold **international reserves**
 - ▶ Foreign currency assets held by government for the purpose of purchasing domestic currency in the foreign exchange market
- ▶ **Balance-of-payment deficit**
 - ▶ The net decline in a country's stock of international reserves over a year
- ▶ **Balance-of-payment surplus**
 - ▶ The net increase in a country's stock of international reserves over a year

Speculative Attacks

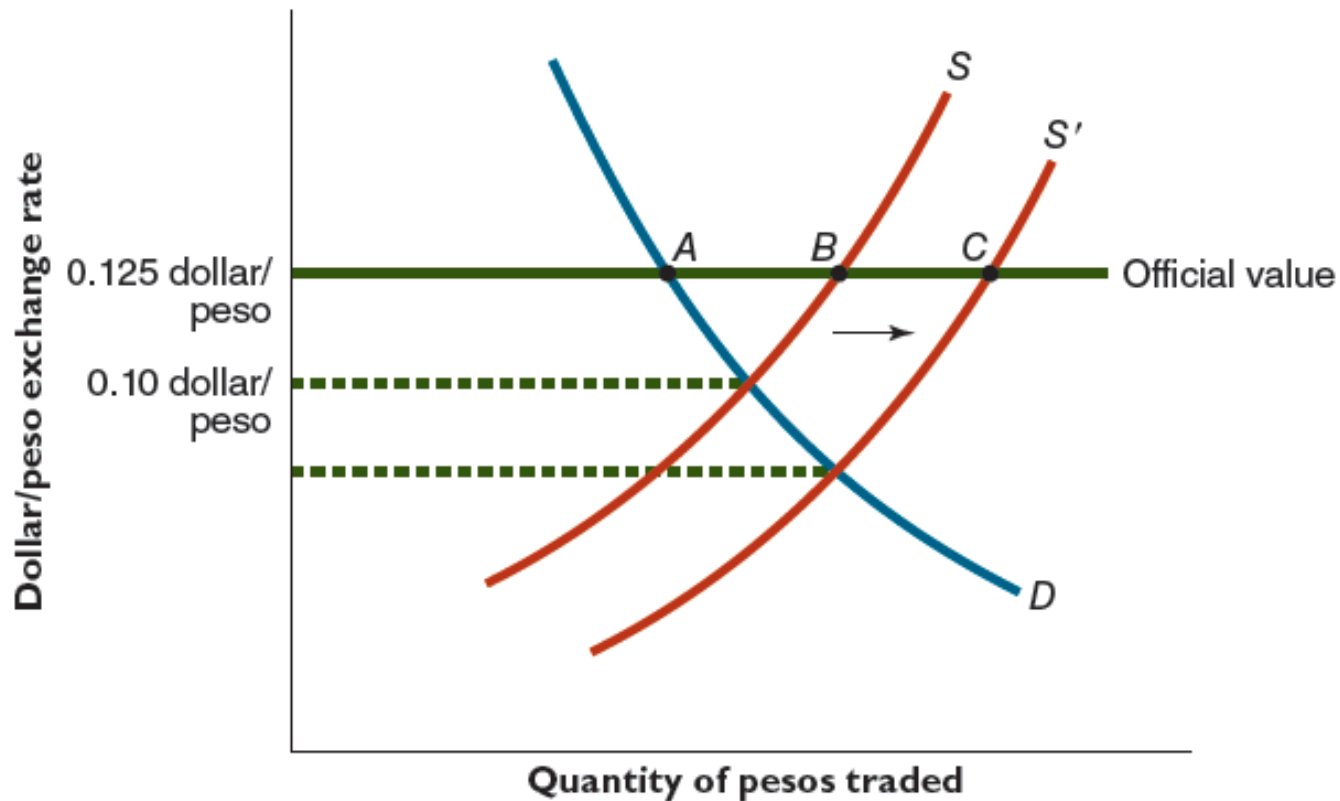
- ▶ A government's attempt to maintain an overvalued exchange rate can be ended quickly and unexpectedly by the onset of a speculative attack
- ▶ **Speculative attack** is a massive selling of domestic currency assets by financial investors
 - ▶ Most likely to occur when financial investors fear/think that an overvalued currency will soon be devalued

Speculative Attacks

- ▶ In our example of Latinia, suppose investors fear that devaluation is imminent as the country's international reserves are getting low
- ▶ To avoid losses, investors start selling peso-denominated assets and offers pesos on the foreign exchange market
- ▶ Supply of pesos shifts right, lowering the fundamental value of peso and forcing the central bank to buy more pesos to maintain the official exchange rate, leading to more rapid depletion of international reserves and possibly an eventual devaluation

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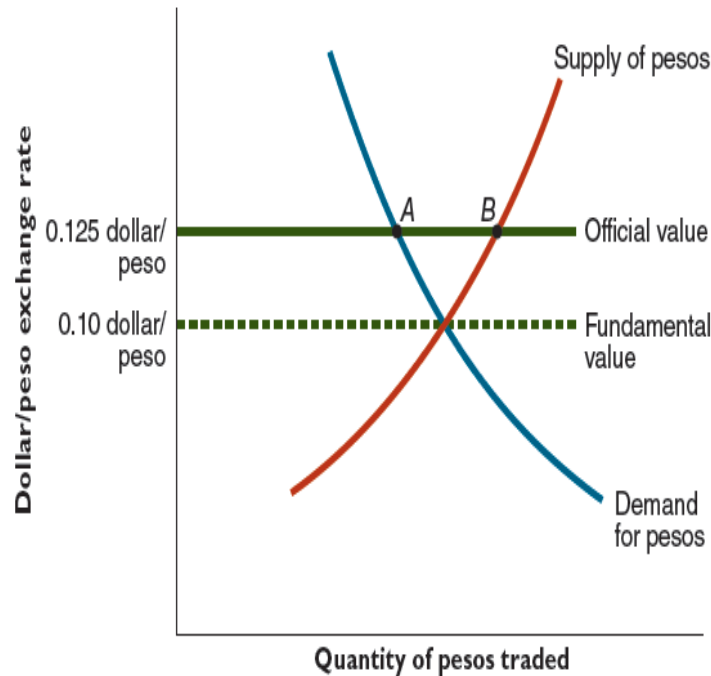
Speculative Attack on the Peso



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Overvalued Exchange Rate

- ▶ Responses to an overvalued currency
 - Devalue the currency
 - Impose trade barriers and restrict purchase of foreign assets
 - Purchase the currency
 - Tighten monetary policy

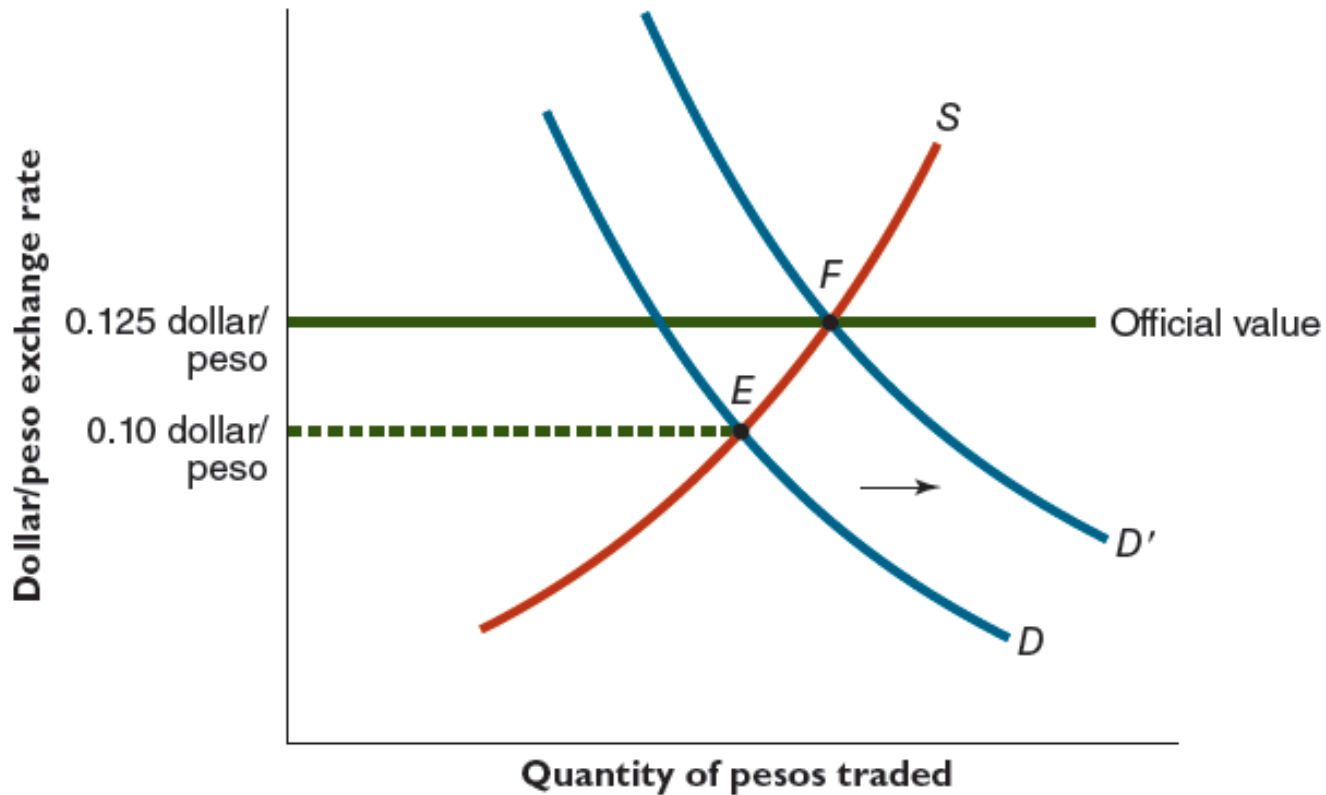


Monetary Policy and the Fixed Exchange Rate

- ▶ Monetary policy can be used to support a fixed exchange rate
 - ▶ An increase in domestic real interest rate increases the attractiveness of domestic assets, leading to an increase in the fundamental value of the exchange rate
 - ▶ If monetary policy is used to set the fundamental value of the exchange rate equal to the official value, it is no longer available for stabilizing the domestic economy
 - ▶ The conflict monetary policymakers face, between stabilizing the exchange rate and stabilizing the domestic economy, is most severe when the exchange rate is under a speculative attack

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Tightening of Monetary Policy Eliminates an Overvaluation





THANKS!

Any questions?

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