Lecture 1

The theory of exchange rate determination

Nina A. Miklashevskaya

Outline

- Defining Exchange Rate
- Measuring Exchange Rate Movements
  - Appreciation/Depreciation of a currency
- Exchange Rate Equilibrium
- Factors that influence Exchange Rate Movements
- **The theory of exchange rate determination**

Key words and concepts

- Exchange rate
- Depreciation
- Appreciation
- Balance of payments
- Devaluation
- Revaluation
- Asset
- Capital mobility
- Volatility
- Foreign exchange market
- Determinants of the exchange rate
- Purchasing power parity (PPP)
- Uncovered interest rate parity (UIP)

What does it mean EXCHANGE RATE?

- Nominal exchange rate
- Spot rate
- Forward rate
- Bilateral exchange rate
- Effective exchange rate
- Real exchange rate

Meaning of Nominal Exchange Rate

- Nominal exchange rate is the relative price of the currency of two countries or value of one currency in units of another currency
- An exchange rate can be quoted in two ways:
  - Direct
    - The price of the foreign currency in terms of domestic currency (*the number of rubles needed to purchase one U.S. dollar*)
  - Indirect
    - The price of domestic currency (pound) in terms of the foreign currency

Measuring Changes in Exchange Rates

- A decline in a local currency's value is referred to as depreciation and an increase in local currency's value is called appreciation.
- If foreign currency A can buy you more units of local currency, currency A has appreciated and local currency depreciated
- If foreign currency A can buy you less units of local currency, currency A has depreciated and local currency appreciated

Appreciation/Depreciation

- **Percentage change in value of Foreign Currency**

New Value of one $ in terms of local Currency - Old value of one $ in terms of local currency

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Old value of one $ in terms of local Currency X 100

- **Depreciation of home country's currency** makes home goods cheaper for foreigners and foreign goods more expensive for domestic residents.
- **Appreciation of home country's currency** makes home goods more expensive for foreigners and foreign goods cheaper for domestic residents.

Exchange Rates and International Transactions

- Exchange Rates and Relative Prices
  - Import and export demands are influenced by relative prices.
  - Appreciation of a country's currency:
    - Raises the relative price of its exports
    - Lowers the relative price of its imports
  - Depreciation of a country's currency:
    - Lowers the relative price of its exports
    - Raises the relative price of its imports

Nominal Exchange Rate

- Bilateral exchange rate is the rate at which you can swap the money of one country for that of another
- Nominal effective exchange rate is a measure of how the local currency does on average against all countries currencies
- $EE=(E_{\$})^{\alpha}(E_{€})^{\beta}(E_{¥})^{\gamma}$ $\alpha+\beta+\gamma=1$

The importance of exchange rate

- Price unification of goods produced in different countries - they enable us to translate different counties' prices into comparable terms
- Influence on the competitiveness of domestic goods in the foreign markets
- Impact on exports and imports. If we know the exchange rate between two countries' currencies, we can compute the price of one country's exports in terms of the other country's money.
    - Example: The dollar price of a £50 sweater with a dollar exchange rate of $1.50 per pound is (1.50 $/£) x (£50) = $75.
- Influence on the relative price of assets and the level of capital mobility
- Affect macroeconomic stability, the inflation rate and inflationary expectations

The Foreign Exchange Market

- Exchange rates are determined in the **foreign exchange market**.
  - The market in which international currency trades take place
- The Actors
  - The major participants in the foreign exchange market are:
    - Commercial banks
    - International corporations
    - Nonbank financial institutions
    - Central banks

    Interbank trading

    - Foreign currency trading among banks
    - It accounts for most of the activity in the foreign exchange market

Functions of FX Market

- The foreign exchange market is the mechanism by which participants:
  - transfer purchasing power across countries;
  - obtain or provide credit for international trade transactions, and
  - minimize exposure to the risks of exchange rate changes

Exchange Rates and International Transactions

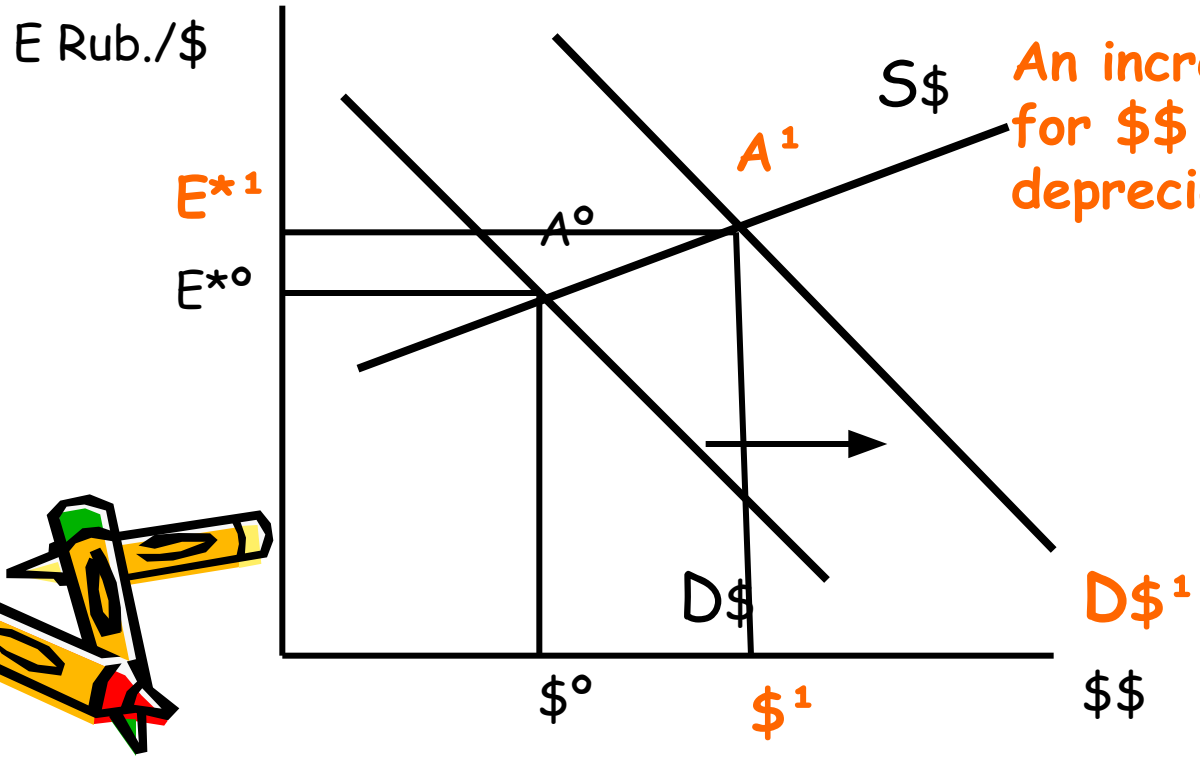
- Spot Rates and Forward Rates
  - **Spot exchange rates**
    - Apply to exchange currencies "on the spot"
  - **Forward exchange rates**
    - Apply to exchange currencies on some future date at a prenegotiated exchange rate
  - Forward and spot exchange rates, while not necessarily equal, do move closely together.

Exchange Rate Equilibrium

- Forces of Demand and Supply
- Demand for foreign currency negatively related to the price of foreign currency
- Supply of foreign currency positively related to the price of foreign currency
- Forces of demand and supply together determine the exchange rate

Foreign Exchange Market

- **At the equilibrium exchange rate E* *the demand for foreign currency equals the supply of foreign currency***



An increase in the demand for $$ causes a depreciation of the ruble

Exchange rate regimes

- **Floating exchange rates – the CB allows the currency to depreciate until the balance of payments deficit is eliminated**
- (the exchange rate as automatic mechanism of adjustment)
- Fixed exchange rates – **the CB intervenes in the foreign exchange market functioning**. It loses foreign exchange reserves in case of a balance of payments deficit.
- **Devaluation/revaluation of domestic currency**

Real Exchange Rate

- The real exchange rate (RER) is the relative price of the goods of two countries.
- RER is the rate at which we can trade the goods of one country for the goods of another

Real Exchange Rate

$$R = \frac{EP^*}{P}$$

- E – nominal exchange rate
- P^*/P – ratio of price levels
- *Real effective exchange rate –*
- $REER=(E_{\$} P_{\$}^*/P)^{\alpha}(E_{€} P_{€}/P)^{\beta}(E_{¥} P_{¥}/P)^{\gamma}$ $\alpha+\beta+\gamma=1$

- ***Real depreciation results an increase in net exports (NX)***

Real Exchange Rate

$$R = \frac{EP_T^*}{P_N}$$

- *Tradables/Nontradables*
- E – nominal exchange rate
- P_T^* - prices of tradables in foreign currency
- P_N - prices of nontradables in local currency
- ***Real depreciation results an increase in net exports***

Real Exchange Rate

$$R = \frac{EW^*}{W}$$

- *E* - nominal exchange rate
- *W** - unit labor costs abroad (in foreign currency)
- *W* - unit labor costs in home country (in local currency)
- ***Real depreciation results an increase in net exports***

Real Exchange Rate

$$R = \frac{EP_{IM}^{*}}{P_{EX}}$$

- *Internal terms of trade*
- E - nominal exchange rate
- P_{IM}^{*} - prices of importable goods in foreign currency
- P_{EX} – prices of exportable goods in local currency
- ***Real depreciation results an increase in net exports***

Why the RER matters

- Real variable
- RER determines the allocation of resources
- Impact on the competitiveness

Current Account Theories

Purchasing Power Parity

- The law of one price - the same good can not sell for different prices in different locations at the same time
- Hypothesis that the nominal exchange rate will adjust so that the purchasing power of a currency will be the same in every country

$$R = \frac{EP^*}{P} = 1 \qquad e = \frac{P}{P^*}$$

PPP Model as Special Case

- PPP model is a special case of the real exchange rate
  - Implies that real exchange rate is fixed at unity
    - No change in real exchange rate
      - However real exchange rates do change therefore there must be important elements of the real world that the PPP theory ignores
        - » PPP assumes all goods entering into the price levels of both countries are internationally traded
        - » Tariffs and transaction costs
        - » Phenomenon of product differentiation
        - » Allows for separate markets (and therefore prices) for import and domestic varieties of a good

PPP Model as Special Case

- Real exchange rate equation captures reality at any point in time
  - PPP relationship never holds exactly
- PPP equation gives a sense of a long-term tendency towards which nominal exchange rates move absent other changes

Exchange Rates in the LR

- PPP holds
- Relative prices are constant. Therefore, the real exchange rate equals one
- The nominal exchange rate returns to its "fundamentals"

Monetary Approach to exchange rates and the "fundamentals" for a currency

Domestic Money Market

$$P = (1+i)\frac{M}{y}$$

Foreign Money Market

$$P^* = (1+i^*)\frac{M^*}{y^*}$$

PPP

$$P = eP^*$$

$$e = \left(\frac{M}{M^*}\right)\left(\frac{Y^*}{Y}\right)\left(\frac{1+i}{1+i^*}\right)$$

This should give us the **long run trend**

Exchange Rates in the SR

- Commodity prices are fixed (PPP fails)
- UIP and Currency markets determine exchange rates

Asset Market Theories

The Demand for Foreign Currency Assets

- The demand for a foreign currency bank deposit is influenced by the same considerations that influence the demand for any other asset.
- Assets and Asset Returns
  - **Defining Asset Returns**
    - The percentage increase in value an asset offers over some time period.
  - **The Real Rate of Return**
    - The rate of return computed by measuring asset values in terms of some broad representative basket of products that savers regularly purchase.

The Demand for Foreign Currency Assets

- Risk and Liquidity
  - Savers care about two main characteristics of an asset other than its return:
    - **Risk**
      - The variability it contributes to savers' wealth
    - **Liquidity**
      - The ease with which it can be sold or exchanged for goods

The Demand for Foreign Currency Assets

- Return, Risk, and Liquidity in the Foreign Exchange Market
  - The demand for foreign currency assets depends not only on returns but on risk and liquidity.
    - There is no consensus among economists about the importance of risk in the foreign exchange market.
    - Most of the market participants that are influenced by liquidity factors are involved in international trade.
      - Payments connected with international trade make up a very small fraction of total foreign exchange transactions.
  - Therefore, we ignore the risk and liquidity motives for holding foreign currencies (perfect capital mobility)

The Demand for Foreign Currency Assets

- Interest Rates
  - Market participants need two pieces of information in order to compare returns on different deposits:
    - How the money values of the deposits will change
    - How exchange rates will change
  - A currency's **interest rate** is the amount of that currency an individual can earn by lending a unit of the currency for a year.
    - Example: At a dollar interest rate of 10% per year, the lender of $1 receives $1.10 at the end of the year.

The Demand for Foreign Currency Assets

- Exchange Rates and Asset Returns
  - The returns on deposits traded in the foreign exchange market depend on interest rates and expected exchange rate changes.
  - In order to decide whether to buy a euro or a dollar deposit, one must calculate the dollar return on a euro deposit.

The Demand for Foreign Currency Assets

- A Simple Rule
  - The dollar rate of return on euro deposits is approximately the euro interest rate plus the **rate of depreciation** of the dollar against the euro.
    - The rate of depreciation of the dollar against the euro is the percentage increase in the dollar/euro exchange rate over a year.

The Demand for Foreign Currency Assets

- The expected rate of return difference between dollar and euro deposits is:

$$R_{\$} = R_{€} + (E^{e}_{\$/€} - E_{\$/€})/E_{\$/€} \quad (1)$$

where:

$R_{\$}$ = interest rate on one-year dollar deposits

$R_{€}$ = today's interest rate on one-year euro deposits

$E_{\$/€}$ = today's dollar/euro exchange rate (number of dollars per euro)

$E^{e}_{\$/€}$ = dollar/euro exchange rate (number of dollars per euro) expected to prevail a year from today

Uncovered Interest Rate Parity (UIP)

- A parity condition stating that the difference in interest rates between two countries is equal to the expected change in exchange rates between the countries' currencies. If this parity does not exist, there is an opportunity to make a profit.

Equilibrium in the Foreign Exchange Market

- Interest Parity: The Basic Equilibrium Condition
  - The foreign exchange market is in equilibrium when deposits of all currencies offer the same expected rate of return.
  - **Interest parity condition**
    - The expected returns on deposits of any two currencies are equal when measured in the same currency.
    - It implies that potential holders of foreign currency deposits view them all as equally desirable assets.
    - The expected rates of return are equal when:

$$R_{\$} = R_{€} + (E^{e}_{\$/€} - E_{\$/€})/E_{\$/€} \qquad (2)$$

Equilibrium in the Foreign Exchange Market

- How Changes in the Current Exchange Rate Affect Expected Returns
  - Depreciation of a country's currency today lowers the expected domestic currency return on foreign currency deposits.
  - Appreciation of the domestic currency today raises the domestic currency return expected of foreign currency deposits.

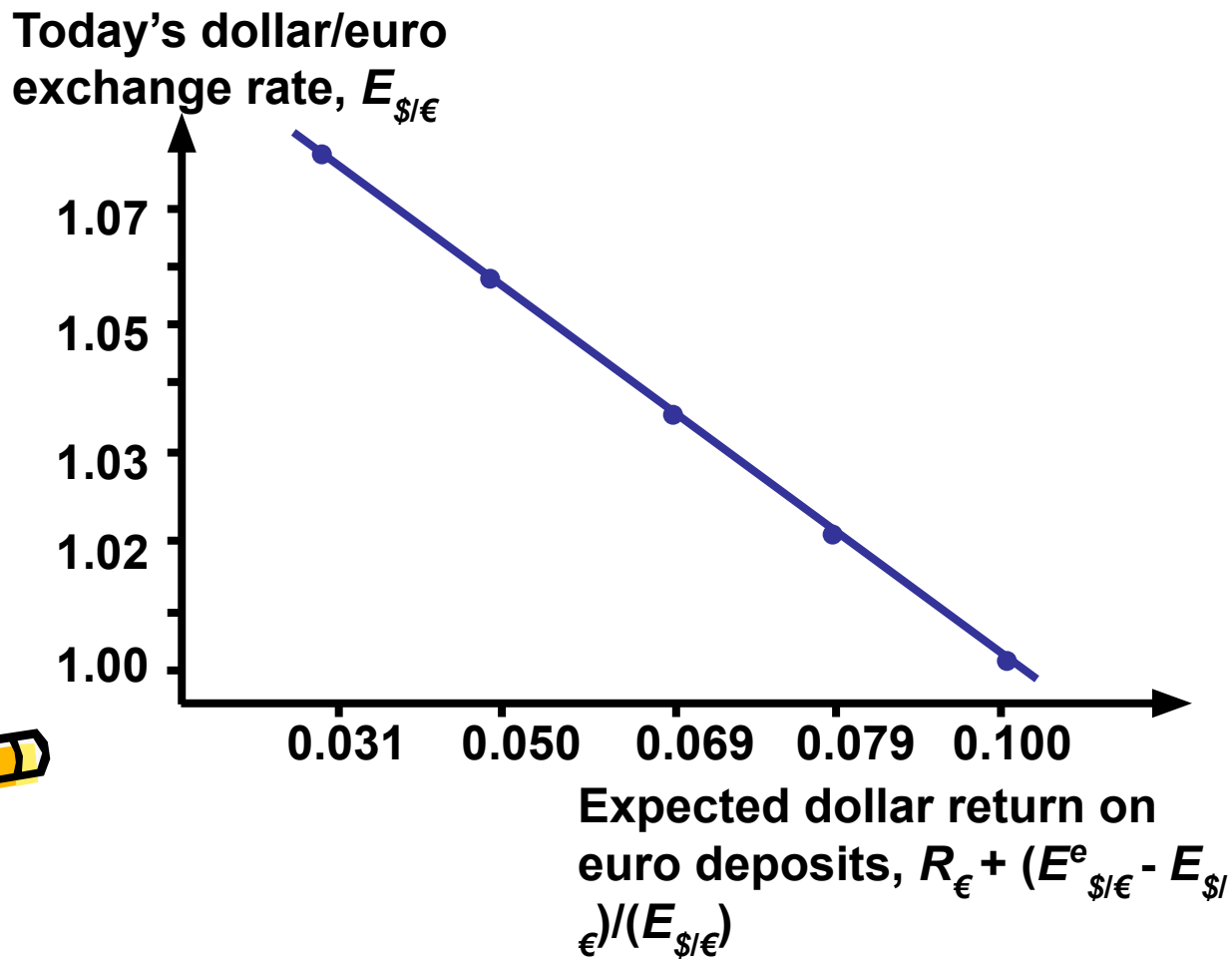
Equilibrium in the Foreign Exchange Market

Today's Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits When $E^e_{\$/€}$ = \$1.05 per Euro

Today's Dollar/Euro Exchange Rate $E_{\$/€}$	Interest Rate on Euro Deposits $R_€$	Expected Dollar Depreciation Rate against Euro $\frac{1.05 - E_{\$/€}}{E_{\$/€}}$	Expected Dollar Return on Euro Deposits $R_€ + \frac{1.05 - E_{\$/€}}{E_{\$/€}}$
1.07	0.05	−0.019	0.031
1.05	0.05	0.00	0.05
1.03	0.05	0.019	0.069
1.02	0.05	0.029	0.079
1.00	0.05	0.05	0.10

Equilibrium in the Foreign Exchange Market

The Relation Between the Current Dollar/Euro Exchange Rate and the Expected Dollar Return on Euro Deposits

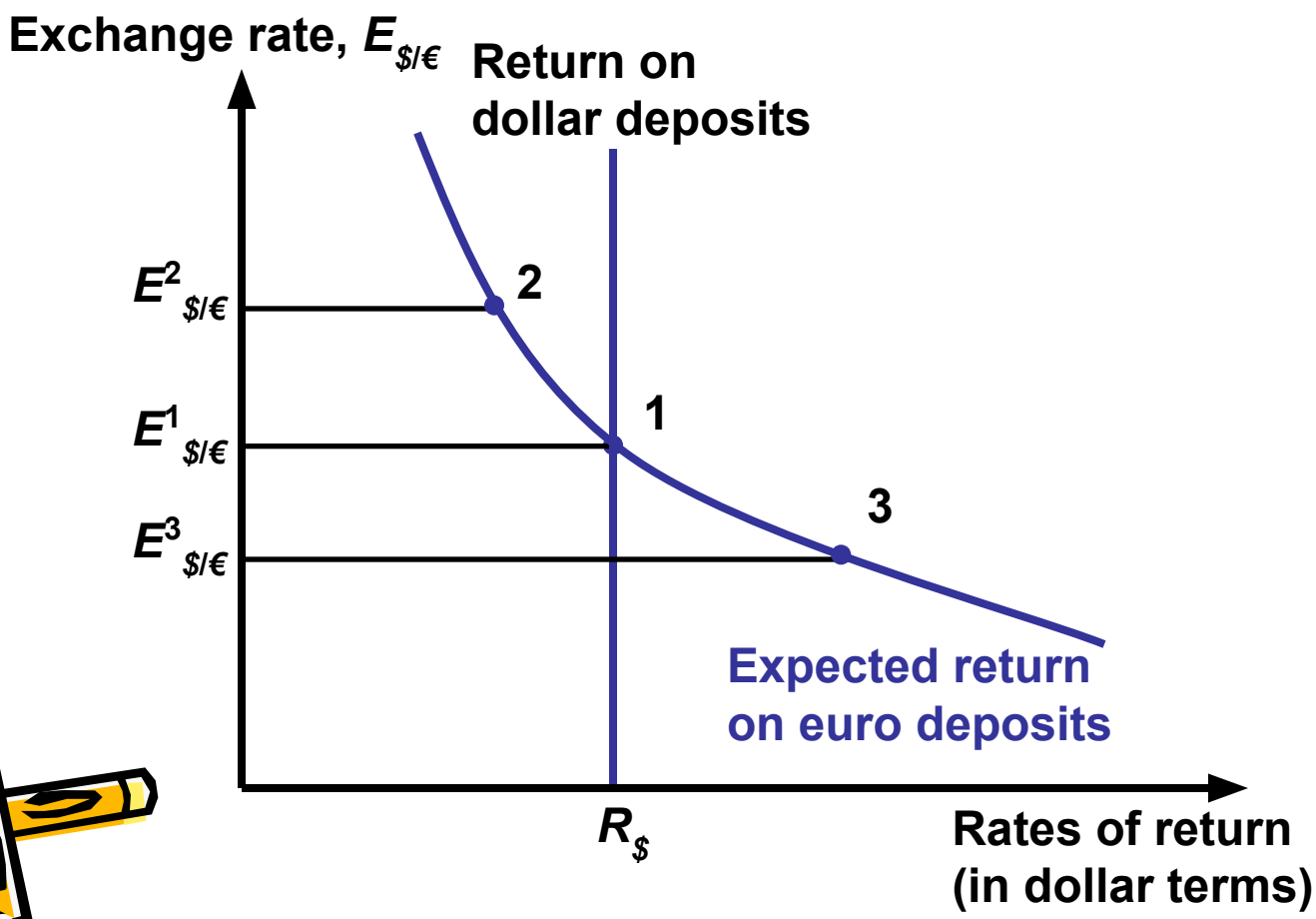


Equilibrium in the Foreign Exchange Market

- The Equilibrium Exchange Rate
  - Exchange rates always adjust to maintain interest parity.
  - Assume that the dollar interest rate $R_{\$}$, the euro interest rate $R_{€}$, and the expected future dollar/euro exchange rate $E^{e}_{\$/€}$, are all given.

Equilibrium in the Foreign Exchange Market

Determination of the Equilibrium Dollar/Euro Exchange Rate

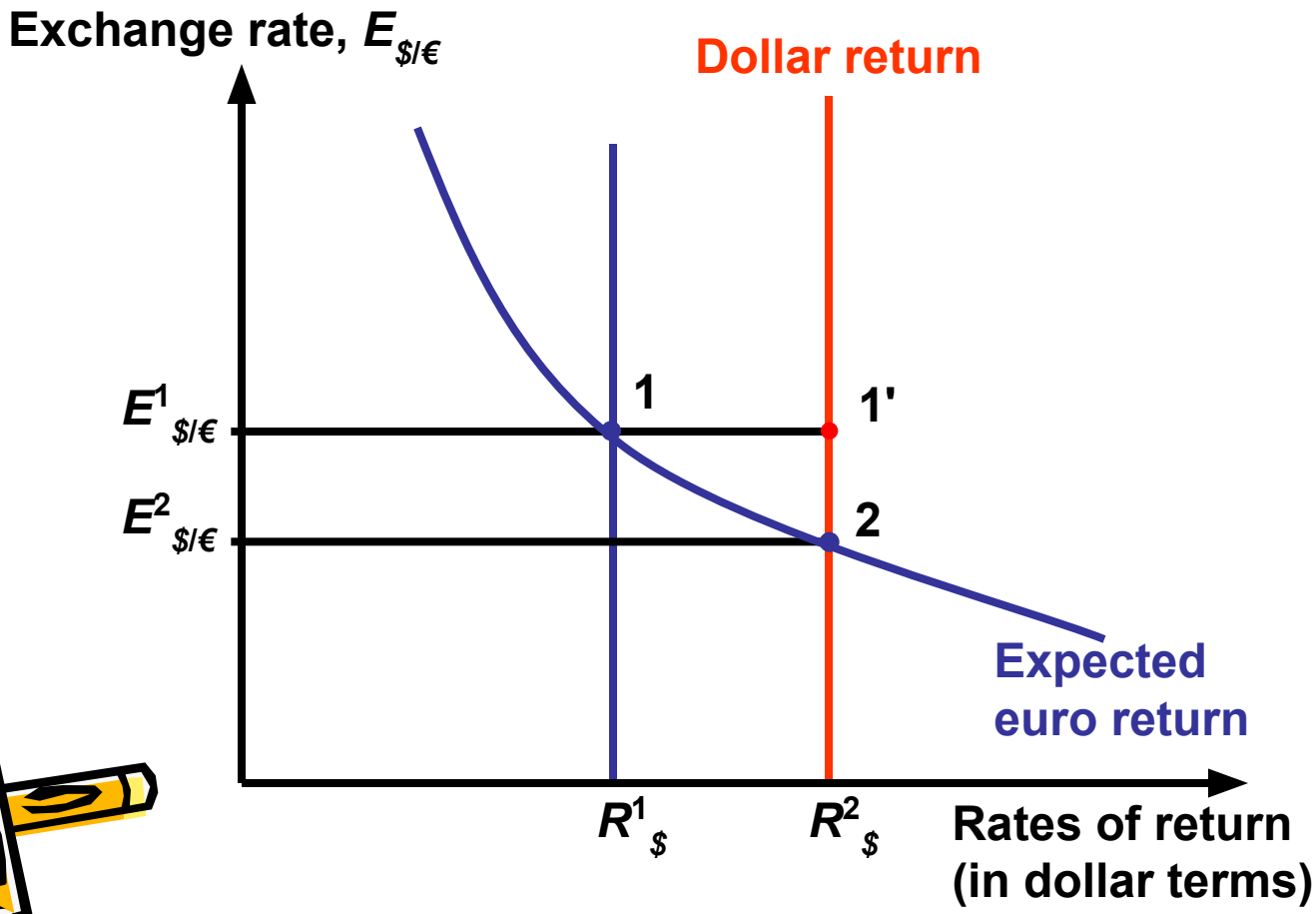


Interest Rates, Expectations, and Equilibrium

- The Effect of Changing Interest Rates on the Current Exchange Rate
  - An increase in the interest rate paid on deposits of a currency causes that currency to appreciate against foreign currencies.
    - A rise in dollar interest rates causes the dollar to appreciate against the euro.
    - A rise in euro interest rates causes the dollar to depreciate against the euro.

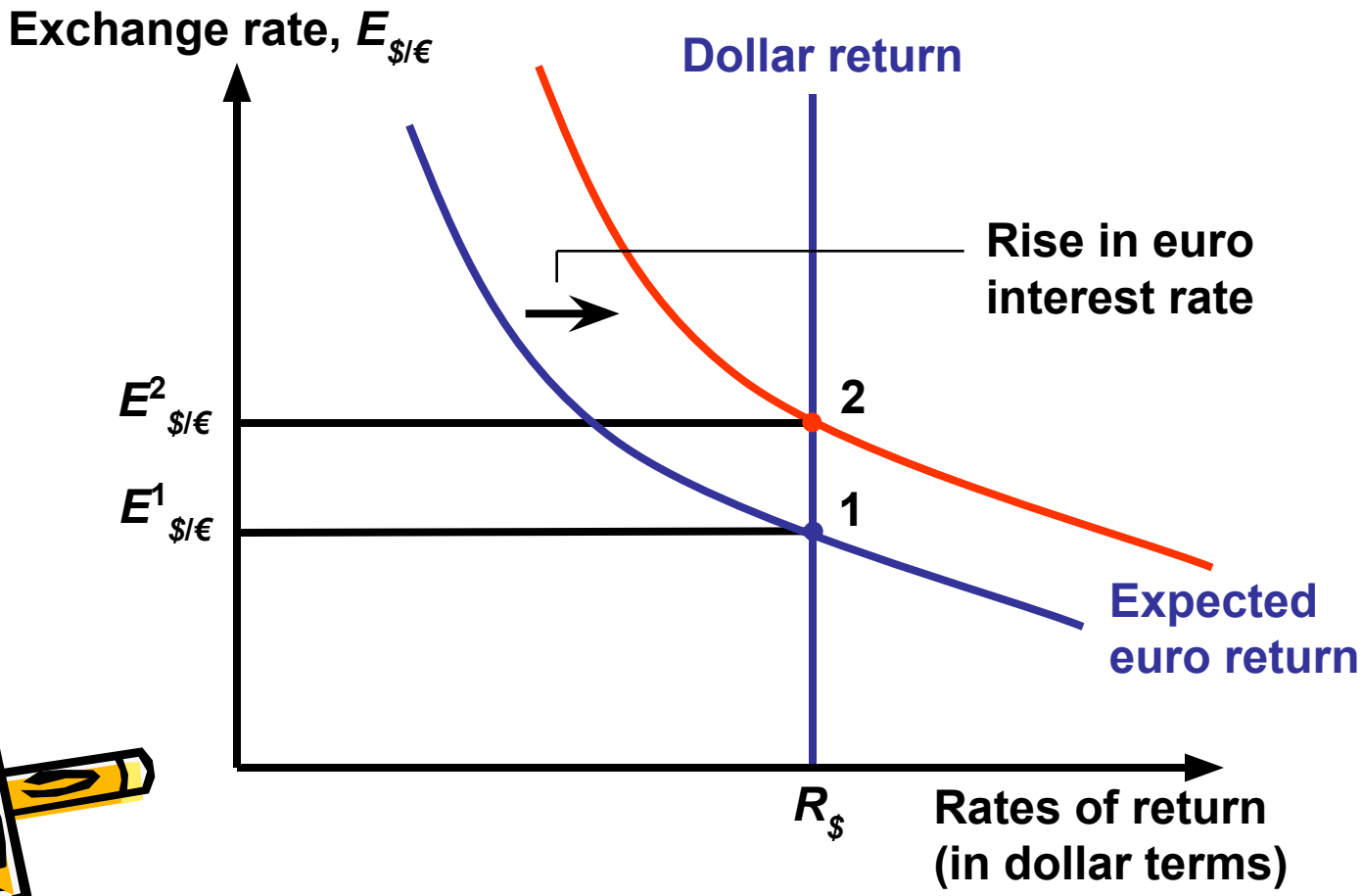
Interest Rates, Expectations, and Equilibrium

Effect of a Rise in the Dollar Interest Rate



Interest Rates, Expectations, and Equilibrium

Effect of a Rise in the Euro Interest Rate



Interest Rates, Expectations, and Equilibrium

- The Effect of Changing Expectations on the Current Exchange Rate
  - A rise in the expected future exchange rate causes a rise in the current exchange rate.
  - A fall in the expected future exchange rate causes a fall in the current exchange rate.

Factors that influence the Exchange Rate

- Expectations of the Market
- Political Events
- Relative Inflation Rates
- Relative Interest Rates
- Relative Income Levels

Exchange rate is the results of an interaction of these factors

Outcomes

- Models of exchange rate determination based on

macroeconomic fundamentals have not had much success in either explaining or forecasting exchange rates, possibly owing to the simplifying assumptions employed.

Micro-based models of exchange rates

- Information is dispersed
- Investors are heterogeneous
- Market trading rules and institutions affect behavior

This line of research provides better explanations of short-term dynamics in exchange rates