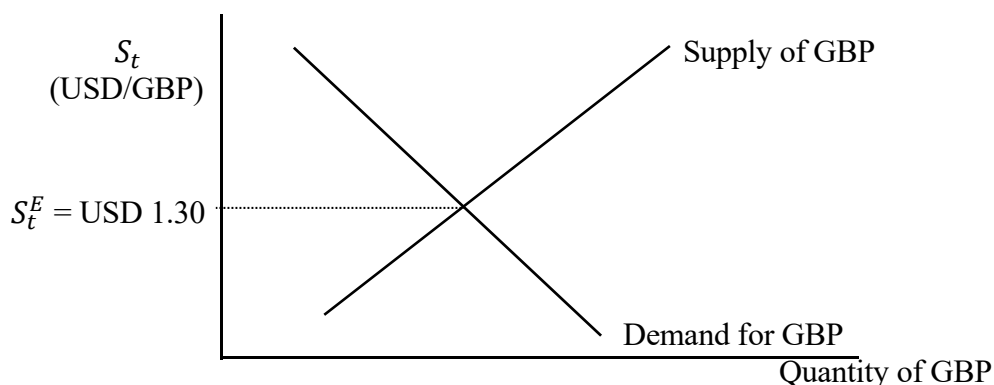


## Chapter 4 – Determinants of FX Rates

### Last Lecture

FX is a huge market (the biggest financial market)

- Open 24/7
- 3 segments: Spot, Forward, and FX swap (biggest)
- Supply and Demand determine  $S_t$  –always expressed as DC/FC.



### This Lecture

Q: What economic factors determine S & D?

#### • Economic Activities behind Supply & Demand

Think about the economic activities that determine the USD/GBP exchange rate.

Q: What kind of activities demand and/or supply GBP in the FX market (say, in the US market)?

- ◊ International Trade: Exports to the UK (supply GBP)  
Imports from the UK (demand GBP)
- ◊ International Investing: British Investors investing in the US (supply GBP)  
US Investors investing in the UK (demand GBP)
- ◊ International Tourism: British tourism to the US (supply GBP)  
US tourism to the UK (demand GBP)
- ◊ Investment Income: British Investors/Companies sending income back home (Dem GBP)  
U.S. Investors/Companies sending income back home (Sup GBP)

#### • Balance of Payments

At the national accounts level, the above activities are reflected in the Balance of Payments (BOP):

$BOP = \text{Current Account (CA)} + \text{Capital Account (KA)}$

$CA = \text{Net Exports of goods and services (main component)} + \text{Net Investment Income} + \text{Net Transfers}$

$KA = \text{Financial capital inflows} - \text{Financial capital outflows}$

The  $BOP = 0 \Rightarrow$  The CA is financed by the KA.

## • Factors Affecting the BOP

Q: Now, what economic variables (“Fundamentals”) affect Supply & Demand (or the BOP)?

A: Several variables:

- Interest rates ( $i_{USD} - i_{GBP}$ ): Affect savings and investments (KA), especially in the short-run.
- Inflation rates ( $I_{USD} - I_{GBP}$ ): Affect trade (CA).
- Income growth rates ( $y_{US} - y_{UK}$ ): Affect everything (both CA & KA).
- Others: Tariffs, quotas, other trade barriers, expectations, taxes, uncertainty, tastes, etc.

We will analyze the effect on  $S_t$  of a change of only one variable at a time.

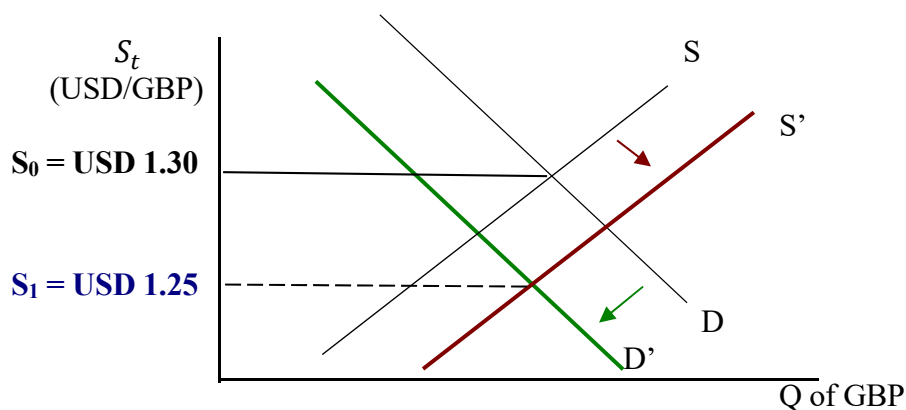
## • A Word about Models

In the economy variables are interrelated, a change of one variable can have an effect on many markets. We will use a *model* to simplify the interactions and focus on the main impact, say money markets, goods markets, etc. These models that focus on the equilibrium in only one market, say the goods market, are called *partial equilibrium models*.

There are other models, *general equilibrium models*, where we study equilibrium in all markets, say the goods market, the money market, and the BOP. We will mention these models, but we will not cover them.

## • Changes in economic variables and $S_t$

1. *Changes in interest rates*: ( $i_{USD} - i_{GBP}$ )  $\uparrow$



Main impact of a change in relative interest rates: capital flows (KA), think of short-term CDs.

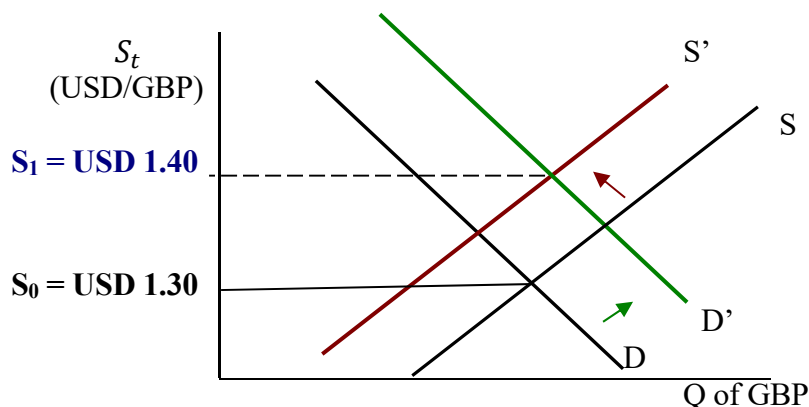
( $i_{USD} - i_{GBP}$ )  $\uparrow \Rightarrow$  US CDs are more attractive than UK CDs.

- More investments in the US from UK residents (supply moves to  $S'$ )
- Less investments in the UK from US residents (demand moves to  $D'$ )

The GBP depreciates against the USD (becomes less expensive in terms of USD). Or, we can also say that the USD appreciates against the GBP.

Check: ( $i_{USD} - i_{GBP}$ )  $\downarrow \Rightarrow S_t \uparrow$

2. **Changes in inflation rates:**  $(I_{USD} - I_{GBP}) \uparrow$



Main impact of a change in relative inflation rates: trade flows (CA).

$(I_{USD} - I_{GBP}) \uparrow \Rightarrow$  US goods are relatively more expensive than UK goods.

- Less purchases of US goods by UK residents –less US exports (supply moves to  $S'$ ).
- More purchases of UK goods by US residents –more US imports (demand moves to  $D'$ ).

The GBP appreciates against the USD (becomes more expensive in terms of USD). Or the USD depreciates against the GBP.

Check:  $(I_{USD} - I_{GBP}) \downarrow \Rightarrow S_t \downarrow$

3. **Changes in income growth rates:**  $(y_{US} - y_{UK}) \uparrow$ . Suppose  $Y_{US} \uparrow$  (&  $Y_{UK}$  remains the same).

When  $Y_{US} \uparrow$  we tend to increase all our demands: we demand more of everything (domestic goods, foreign goods, investments, money, etc.). The final effect on  $S_t$  depends on which variable (market) has a bigger impact on S&D.

There are two main equilibrium stories:

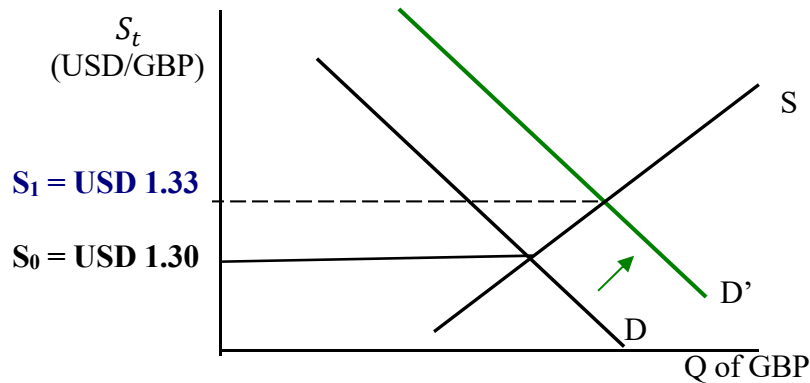
- ◊ Balance of Trade Approach (Approach in Madura's textbook)
- ◊ Monetary Approach (MA)

3.1 BT Approach

Under the BT approach, trade flows –i.e., exports and imports– are the main factors influencing demand and supply for FC. The CA is the main determinant of  $S_t$ . (This is the story in the textbook, standard view before the financial liberalization of the '70s.)

BT:  $Y_{US} \uparrow$  (& no change in  $Y_{UK}$ )  $\Rightarrow$  More US demand of everything, among them imports (M) from UK. The  $TB_{US} (=X-M) \downarrow$ . Demand for GBP increases  $\Rightarrow S_t \uparrow$

(Note: We can think that under the BT approach,  $Y_{US} \uparrow$  has no significant effect on US interest rates.)



Note: Things are dynamic. As UK exports more,  $Y_{UK} \uparrow$ . Then, US exports more to the UK (S also moves). The net effect on the  $TB_{US}$  will depend on imports and exports income elasticities. Strange things can happen, but, in general, we expect an increase in the TB to appreciate the domestic currency.

### 3.2 Monetary Approach

Under the MA,  $S_t$  is determined in equilibrium by relative money demand and money supply between the two currencies involved. Each currency is just another asset, whose yield is given by  $i_{DC}$  &  $i_{FC}$ . Thus, interest rates and income will influence demand for money and, thus, currency. Money supply will also be a relevant variable that affects the yield.

MA:  $Y_{US} \uparrow \Rightarrow$  More US demand of everything, among them domestic money (USD). Demand for US money increases  $\Rightarrow i_{USD} \uparrow \Rightarrow (i_{USD} - i_{GBP}) \uparrow$  (capital flows move in favor to the U.S.)  $\Rightarrow S_t \downarrow$

**Remark:** Financial variables, like interest rates and exchange rates, adjust very quickly to changes. It will take longer for companies to adjust trade flows, due to long-term contracts, bureaucracy, etc.

The MA is the usual story reported by the press, since exchange rates will adjust very quickly to changes in interest rates. When a country grows, in the short-run, its currency tends to appreciate.

Note: There is a variation of the MA, called the *portfolio-balance approach*, where relative demands and supplies of domestic and foreign bonds also play a role in determining  $S_t$ . For this approach to work, domestic and foreign bond have to be *imperfect substitutes* (otherwise, they will have the same price and relative demands/supplies will be irrelevant).

For example, an increase in the relative supply of domestic bonds to foreign bonds comes with an increased compensation (otherwise, no incentive to hold them) on the domestic bonds that will make the DC depreciate in the spot market ( $S_t \uparrow$ ).

$\Rightarrow$  If the expected future spot rate,  $E_t[S_{t+T}]$ , is unchanged the expected rate of appreciation (depreciation) over the future  $T$  days increases (decreases).

### **4. Other:**

- ◊ Quotas: Affect foreign trade and the CA.
- ◊ Expected Rates of Return on financial assets/real estate: Affect the KA.
- ◊ Uncertainty: Political problems, war, terrorism, etc.

- ◊ Tastes: A sudden increase in tastes for foreign goods, say luxury goods.
- ◊ Worker's skills/Technology: Anything that improves worker productivity/production costs.
- ◊ Expectations: If a lot of people expect the GBP to depreciate, it is optimal to sell GBP, regardless of the truth behind the expectation. The GBP can depreciate in a hurry (think of Keynes' beauty contest). Recall that financial assets are influenced by expectations about the future value of the asset.

• **Remarks:**

◊ *Interactions among variables:* So far, we have assumed that only one variable changes (the *ceteris paribus* assumption). But, in economics, variables are interrelated. Higher inflation means a higher interest rate; restrictions to trade affect income, etc. In these situations, when we are drawing the S&D curves, we need to make assumptions about which curve moves more –that is, which effect is the dominant one.

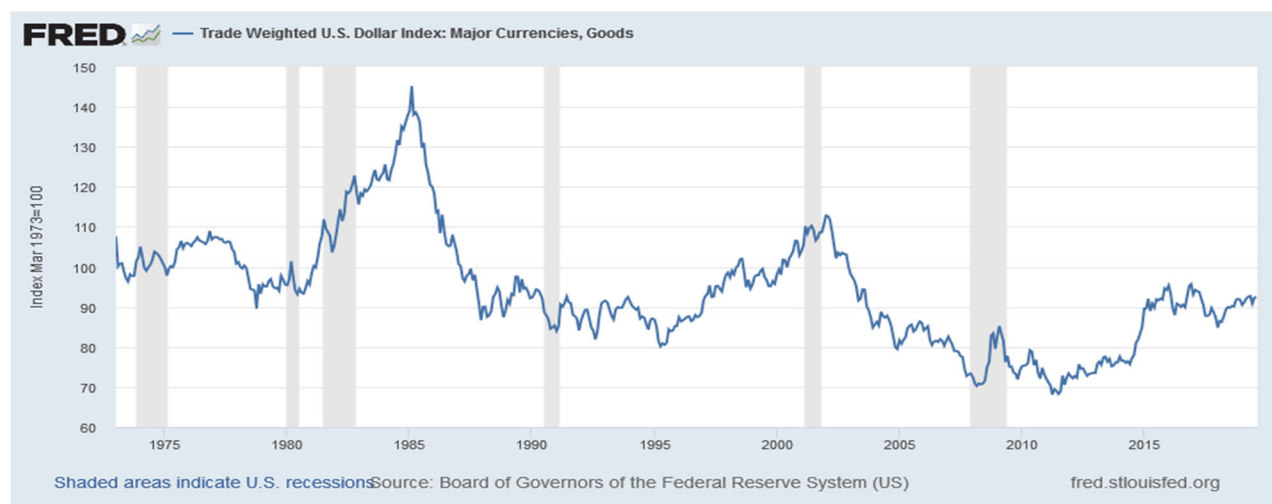
◊ *No dynamics:* In all the S&D graphs above, we presented two situations: initial equilibrium (with  $S_0$ ) and final equilibrium (with  $S_1$ ). We have paid no attention to the adjustment process –i.e., how  $S_t$  moves from  $S_0$  to  $S_1$ .

• **Exchange Rates Move a Lot**

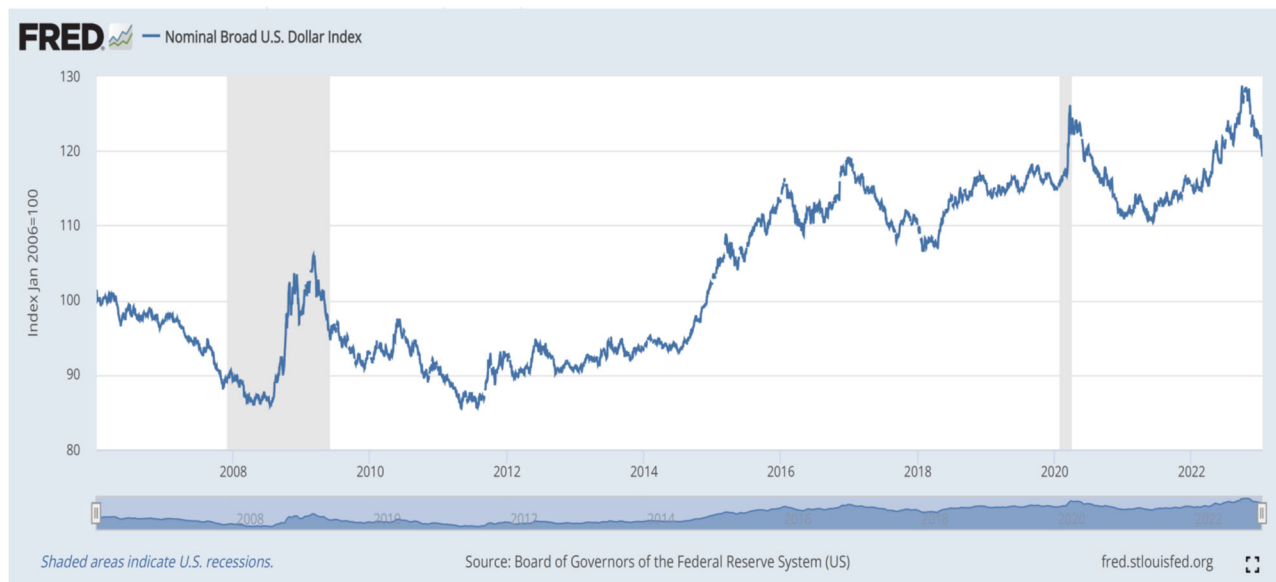
The Federal Reserve constructs an index to reflect the value of the USD against a basket of currencies (TWC). The Fed changes the basket, accordingly to trade patterns. The old basket includes the EUR (58%), the JPY (14%), the GBP (12%), the CAD (9%), the SEK (4%), and the CHF (4%). It is quoted in TWC/USD terms.

Exhibit 4.1 shows the performance of the USD against the TWC since 1973, just after the U.S. abandoned the fixed exchange rate system (see Chapter 6). As it can be seen, the USD moves a lot, though, in general, slowly over time.

**Exhibit 4.1**  
**The Value of the USD against the TWC,  $S_t$  (TWC/USD)**



Below, we show the new basket, Nominal Broad USD Index, started in 2020. The Fed computed the new basket retroactively to 2006. It is quoted in TWC/USD terms.



## Chapter 5 - FX Derivatives

$S_t$  changes with several variables:  $(i_{USD} - i_{GBP})$ ,  $(I_{USD} - I_{GBP})$ ,  $(y_{US} - y_{UK})$ .

Interest rates, in particular, change all the time.  $S_t$  will also change. (See Exhibit 4.1.) This introduces *exchange rate risk* (one form of price risk).

FX Derivatives will help us to reduce the risk in FX transactions. We'll study:

1. Currency Futures/Forwards (agreement to buy/sell FC at a given price at time T)
2. Currency options (right to buy/sell FC at a given price during a period of time, t to T)

### 1. Currency Futures/Forwards

- Currency forwards are tailor-made contracts, traded in the OTC (over the counter) market.
- Currency futures are exchange listed contracts.
- Standardized contracts that work like commodity futures.
- The CME ("Merc") lists contracts on major currencies with respect to the USD.
- Currency futures/forwards are agreements to buy/sell a quantity (size) of FC at a fixed price (futures price) at a given time (maturity).

### 2. Currency Options

- Currency options are both exchange-listed and OTC.
- Options give their owners (buyer) rights, not obligations.
- The seller of the option is called the writer.

- The buyer pays an amount called a "premium" to the seller.
- Call options give the right to purchase a quantity (size) of FC at a fixed price (strike price) during a time interval ending at time T (maturity).
- Put options, same as call options, but give the buyer the right to sell.
- In the US, the Philadelphia Stock Exchange lists calls and puts on FX.

## CHAPTER 4 - APPENDIX: KEYNES' BEAUTY CONTEST AND INVESTORS



“Professional investment may be likened to those newspaper competitions in which the competitors have to pick out the six prettiest faces from a hundred photographs, the prize being awarded to the competitor whose choice most nearly corresponds to the average preferences of the competitors as a whole; so that each competitor has to pick, not those faces which he himself finds prettiest, but those which he thinks likeliest to catch the fancy of the other competitors, all of whom are looking at the problem from the same point of view.”

From the perspective of modern economics, Keynes' beauty contest is a coordination game -i.e., a game where the participants get high (low) payoff if they choose the same (a different) action. You may sell (or buy) an asset, say GBP, not because you think it is overvalued. You may sell GBP because you think the other investors think it is overvalued!

## CHAPTER 4 – BRIEF ASSESMENT

- 1) In the MXN/USD market, draw a graph showing the effect on  $S_t$  of the following surprises:
  - a) Interest rates in Mexico increase (everything else remains the same).
  - b) The inflation rate in Mexico decreases (everything else remains the same).
  - c) The Mexican economy slows down (everything else remains the same). Be specific about the theoretical approach you use to answer this question.
  
- 2) Suppose a European country surprisingly votes to exit the European Union. What is the effect of this decision on the EUR/USD exchange rate. Draw a graph.
  
- 3) The U.S. government decides to increase tariffs on Mexican imports (“border-adjustment tax”). What is the effect of this new tariff on the USD/MXN exchange rate?
  
- 4) UAE’s economy is very dependent on oil exports. Draw a graph showing the effect on  $S_t$  (AED/USD) of a sudden increase in the price of oil.