Exchange Rates in the Short Run

- What determines exchange rates in the short-run?
  - Exchange rates are priced like financial assets
  - Asset prices change quickly, often by more than contemporaneous changes in underlying determinants
  - Markets are forward looking, react to what is expected
- The asset market approach to exchange rates
  - The role of interest rates
  - The role of the expected future spot rate
- Exchange rate dynamics and “overshooting”
  - What happens when asset prices are very flexible while consumer goods prices are “sticky”?
  - Is “overshooting” bad? Is “overshooting” avoidable?
- Forecasting exchange rates - Is it possible?

The Asset Market Approach

- What determines the current price of an equity share?
  - \( P(t) = \text{Net present value of all future cash flows} \)
  - \( P(t) = \text{Net present value of future equity share price} \)
  - \( P(t) = \frac{P(t+1)}{1 + (i(risk-free) + i(risk-premium))} \)
  - Current share price reflects markets’ expectation of important underlying variables
  - Current share price responds to news about these variables
- What determines the current price of foreign exchange?
  - \( S(t) = \text{Net present value of all future driving variables} \)
  - \( S(t) = \text{Net present value of future exchange rate} \)
  - Current exchange rate reflects markets’ expectation of important underlying variables
  - Current exchange rate responds to news about these variables
The Asset Market Approach to Exchange Rates

- \( S(t) \) = Net present value of future exchange rate
- Recall Uncovered International Investment (Chap 17, p. 14)
  - When **uncovered interest parity** holds, then
    \[ 0 = EUD = (S_{t+3}^*/S_t) \times (1+i_{UK}) - (1+i_{US}) \]
    where \( S_{t+3}^* \) is your expectation of the future spot rate 3-months from today
  - Rearranging terms we have:
    \[ S_t = S_{t+3}^* \times \frac{1+i_{UK}}{1+i_{US}} \]  \[1\]
  - The above equation is approximately the same as:
    \[ S_t = S_{t+3}^* \times \frac{1}{1+i_{US} - i_{UK}} \]  \[2\]
- Equation (2) \( \Rightarrow \) current exchange rate is present value of future exchange rate, where \( i_{US} - i_{UK} \) is discount factor
  - Discount factor does not reflect currency, liquidity or country risk

Determinants of the Exchange Rate in the Short Run

- Repeating equation (1) from last page

\[
S_t = S_{t+3}^* \times \frac{1+i_{UK}}{1+i_{US}}
\]

we can easily see the impact of changes in \( S_{t+3}^*, i_{US} \) and \( i_{UK} \) on the current spot exchange rate:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Direction</th>
<th>Impact on ( S(t) ) ($/£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US interest rate</td>
<td>↑</td>
<td>( S_t ) ↓ (US$ appreciates)</td>
</tr>
<tr>
<td>UK interest rate</td>
<td>↑</td>
<td>( S_t ) ↑ (US$ depreciates)</td>
</tr>
<tr>
<td>Expected future</td>
<td>↑</td>
<td>( S_t ) ↑ (US$ depreciates)</td>
</tr>
</tbody>
</table>

- Caution: Impact on current spot rate assumes change in one variable **only**. Other variables assumed unchanged.
### Numerical Examples (1 of 3)

\[ S_t = S_{t+1 \text{ year}} \times \frac{1+i_{\text{UK}}}{1+i_{\text{US}}} \]

<table>
<thead>
<tr>
<th>Base case</th>
<th>i($) up</th>
<th>i(£) up</th>
</tr>
</thead>
<tbody>
<tr>
<td>S ($/£)</td>
<td>1.5425</td>
<td>1.5280</td>
</tr>
<tr>
<td>S (expected)</td>
<td>1.5000</td>
<td>1.5000</td>
</tr>
<tr>
<td>i (£) 1 year</td>
<td>9.00%</td>
<td>9.00%</td>
</tr>
<tr>
<td>i ($) 1 year</td>
<td>6.00%</td>
<td>7.00%</td>
</tr>
</tbody>
</table>

Holding S(expected) constant
- An increase in i($) leads to an appreciation in the $.
- An increase in i(£) leads to an appreciation in the £.

### Numerical Examples (2 of 3)

\[ S_t = S_{t+3 \text{ months}} \times \frac{1+i_{\text{DM}} / 4}{1+i_{\text{US}} / 4} \]

<table>
<thead>
<tr>
<th>Base case</th>
<th>i($) up</th>
<th>i(DM) up</th>
</tr>
</thead>
<tbody>
<tr>
<td>S ($/DM)</td>
<td>0.5001</td>
<td>0.4976</td>
</tr>
<tr>
<td>S (expected)</td>
<td>0.5050</td>
<td>0.5050</td>
</tr>
<tr>
<td>i (DM) 90 days</td>
<td>5.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td>i ($) 90 days</td>
<td>9.00%</td>
<td>11.00%</td>
</tr>
</tbody>
</table>

Holding S(expected) constant
- An increase in i($) leads to an appreciation in the $.
- An increase in i(DM) leads to an appreciation in the DM.

Textbook examples, p. 383
Numerical Examples (3 of 3)

\[ S_t = S_{t+1 \text{ year}} \times \frac{1 + i_{UK}}{1 + i_{US}} \]

Holding interest rates constant
- An increase in S(expected) leads to an depreciation in the $.
- A decrease in S(expected) leads to an appreciation in the $.

<table>
<thead>
<tr>
<th>Base case</th>
<th>S* up</th>
<th>S* down</th>
</tr>
</thead>
<tbody>
<tr>
<td>S ($/£)</td>
<td>1.5425</td>
<td>1.5939</td>
</tr>
<tr>
<td></td>
<td>1.5000</td>
<td>1.5500</td>
</tr>
<tr>
<td>S (expected)</td>
<td>1.4910</td>
<td>1.4500</td>
</tr>
<tr>
<td>i (£) 1 year</td>
<td>9.00%</td>
<td>9.00%</td>
</tr>
<tr>
<td></td>
<td>9.00%</td>
<td>9.00%</td>
</tr>
<tr>
<td>i ($) 1 year</td>
<td>6.00%</td>
<td>6.00%</td>
</tr>
<tr>
<td></td>
<td>6.00%</td>
<td>6.00%</td>
</tr>
</tbody>
</table>

Caution! Caution! Caution!

- The result that a rise in the home interest rate leads to an appreciation in home currency assumes that the future expected spot rate is unchanged.
- Suppose interest rates rise in the home country because people have raised their expectation of expected future inflation. Then what?
  - Then, based on the PPP theory, \( S \uparrow \).
  - It is still true that \( S_t \) is the present value of \( S' \). But if \( S' \) has risen sharply because of inflationary fears, then the analyst may observe that \( S_t \uparrow \) when \( i(\text{home}) \uparrow \).
- An easy way to remember - hyperinflationary economies
  - High interest rates need not attract capital when inflation is high.
  - Investors are attracted by high real interest rates.
“Overshooting” defined - prices move by “too much” in the short-run relative to some benchmark
» Relative to the movement if markets had full information
» Relative to the movement needed to establish PPP
» Our def’n: Relative to the movement required in the long-run

You have encountered overshooting before in the market for goods that are in limited supply when there is a sudden demand shock (see next page)
» “Overshooting” of this sort is not bad, an equilibrium result caused by rigidities of some sort
◆ Typical microeconomics example: Rigidities in supply
◆ International finance example: Stickiness in goods prices

Price Dynamics and “Overshooting”

Price Dynamics in the Market for Honda (fuel efficient) Automobiles

- Initial equilibrium at “A”, then sudden shift in demand from D to D’
- In the short-run prices “overshoot” to $12,000 and gradually adjust to their long-term equilibrium at $11,000
**Inflation and Exchange Rate Dynamics**

Variability of the US$/DM Exchange Rate and of U.S./German Price Level Ratio


<table>
<thead>
<tr>
<th>Percentage Change per Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
</tr>
<tr>
<td>15%</td>
</tr>
<tr>
<td>10%</td>
</tr>
<tr>
<td>5%</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td>-5%</td>
</tr>
<tr>
<td>-10%</td>
</tr>
<tr>
<td>-15%</td>
</tr>
<tr>
<td>-20%</td>
</tr>
</tbody>
</table>

Time: 101 quarters over 25 years

As an empirical regularity, we find that prices of goods are less variable in the short-run than exchange rates. Domestic prices of goods are described as "sticky" or "rigid" but in the long-run, goods prices become more flexible.

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**Exchange Rate Overshooting (1 of 2)**

Consider the following "experiment"

Assume \( i(\$)=i(\£) \) and exchange rate is flat and not expected to change.

**NOW**, let the US money supply rise unexpectedly by 1% at time \( T(1) \), while conditions in the rest of the world stay unchanged.

The surplus of money leads $ interest rates to fall, but goods prices are sticky.

As a result, capital flows out of US, and toward foreign investments, and $ depreciates.
Exchange Rate Overshooting (2 of 2)

$ has two strikes against it
(1) Low interest rates
(2) Excess money supply likely to cause inflation in the long run
Puzzle: How to get investors to willingly hold US$ assets?
Answer: Let the US$ depreciate immediately by “too much”, to “overshoot”
Then in the medium run, the US$ can appreciate, and compensate investors for the low $ interest rate

Lessons of Exchange Rate Overshooting

✦ Why does exchange rate “overshooting” occur?
  » Goods prices are sticky in the short run. If goods prices were completely flexible, then \( M(US) \uparrow \) by \( x\% \), \( P(US) \uparrow \) by \( x\% \), and \( S(\$/£) \uparrow \) by \( x\% \) in an instant. (Monetary approach + PPP)
  » Capital is very mobile, and asset prices adjust quickly.
  » The world is noisy. Unexpected macroeconomic shocks.
✦ Is overshooting a bad thing? In our context, “No”
  » It is an natural process to equilibrate returns in US assets and foreign assets, and remove arbitrage profits
  » It reflects full information, and not confusion
  » Would be better to have fewer macroeconomic surprises (less exchange rate volatility), but surprises happen.
✦ Even with overshooting, PPP holds in long run
Predicting Exchange Rate Changes

- Should be very difficult to predict changes
  - Asset markets tend to be efficient, prices reflect information
  - Short-run price changes caused by “news” - unpredictable
- Short-run prediction
  - Many analysts use technical, trend-following models to predict the direction (but not magnitude) of changes
  - No traditional economic foundation for these models, but studies find that they are often useful and profitable.
- Medium to Long-run prediction
  - Some evidence that exchange rates gravitate toward the values indicated by structural, monetary models
  - Short-run deviations are temporary, in the medium to longer run, fundamentals matter for exchange rates

Summary on Exchange Rates in the Short-Run

- Exchange rates are priced like financial assets
  - Market participants are forward looking
  - Current price reflects the present value of the future price
  - Prices change quickly in response to changes in home interest rate, foreign interest rates, and expectations
- In the short-run exchange rate volatility may exceed volatility in fundamentals
  - Some of this volatility is due to “overshooting”
  - Overshooting can result from sticky good prices and high capital mobility, not the result of market confusion
- Exchange rate forecasting is difficult
  - As is forecasting other financial assets like stocks and bonds
  - Some possibilities of forecasting in medium- to long-run