Andreas Krause

Foreign exchange markets

- We will look at how exchange rates are determined. As currencies have no intrinsic value, such a regular payment to their holders, we need to look at the benefits that currencies give its owners.
- These benefits include the ability to purchase goods for consumption or make investments and obtain a return on this investment for future consumption.
- Looking at the value of these benefits will necessitate the comparison with alternative benefits, those in the domestic country and will have to take into account macroeconomic conditions.
- We will look initially at the goods markets and investments separately and then consider more short-term deviations from these long-term equilibria.

The role of exchange rates

- Foreign exchange markets are used to make payments in international trade and foreign investments
- The price of a currency, relative to another currency, is the exchange rate
- The exchange rate is determined such that outcomes in both countries are identical, this is referred to as a parity
- In addition, we will see that exchange rates can be used to clear markets quickly while the economy adjusts to shocks

The role of exchange rates

→ Exchange rates between currencies are the result of demand and supply for the respective currencies, but this demand and supply should result in some specific values that we seek to establish.

- We need to use foreign exchange markets, that is obtain foreign currencies, if we want to make payments for goods and services obtained abroad,
- or if we make investments into foreign countries or obtain payments from such investments.

- The exchange rate is a relative price of one currency against another currency. usually we use 'money' as the basis for accounting for any purchases or investments, but here both currencies are 'money' and we can only determine the relative price of these two, there is no natural benchmark.
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  - The idea when determining an exchange rate is that the it makes no difference whether the action (purchase of goods or investment) is taken domestically or in a foreign country.
  - An exchange rate that ensures that outcomes are identical across countries is referred to as a 'parity'.
- We will also see that exchange rates can be used to obtain a short-run equilibrium reacting to an exogenous shock, if other variables in an economy cannot adjust quickly.

→ We will thus look at the long-term exchange rates, but also at short term deviations due to exogenous shocks.

Triangular arbitrage

- The exchange rate between different currency pairs is kept consistent with arbitrage
- Investors might directly exchange currencies A for currency B
- Alternatively they can first exchange currency A for currency C, and then currency C for currency B
- These two investment strategies should yield the same outcome

Triangular arbitrage

→ We will briefly discuss the consistency of exchange rates across different currency pairs.

- Each currency pair will have an exchange rate and while we will only look at a single of such pairs, we have to be aware that there are many more such relationships. All exchange rates need to be kept consistent with each other; this is achieved through arbitrage.
- We consider a strategy in which an investors exchanges the currency of country A against the currency of country B at some given exchange rate.
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  - An alternative investment strategy is to exchange the currency of country A for country C instead.
  - In a second step the currency for country C is then exchanged for that of country B. the end result in both cases is that the investor holds the currency of country B.
- These two strategies have to yield the same amount of currency in country B. If this was not the case all transactions would be conducted via the more favourable route, which will affect demand and supply of the respective currencies, resulting in exchange rates to adjust.

→ This is referred to as triangular arbitrage and ensures exchange rates are consistent with each other. for most currency pairs this arbitrage works will and we can focus on the exchange rate between a single pair of currencies and neglect any potential inconsistencies across currencies.

Identical prices and returns across countries

- International trade allows the exchange of goods and a good should not be cheaper in one country than another
- This idea has lead to the development of the BigMac index, the KFC index, or iPad index to determine overvalued and undervalued currencies
- Similarly, should otherwise identical investments in one country not yield a higher return than in another country
- The exchange rate should adjust such that goods prices and returns are identical across countries
- We will look at how exchange rates achieve these parities

Identical prices and returns across countries

→ We will first look at how exchange rates can ensure that prices and investment across countries give us the same outcome. We will thus look at long-term exchange rates.

- If goods are traded internationally, we can buy them in one country to sell in another country. Such a transaction would involve the purchase or sale of a foreign currency, which will affect the revenue received or the costs of the trader.
- The exchange rate should be such that both goods have the same price in both countries. If this was not the case there would be high demand for the good in one country and low demand for the good in another country; this would not be an equilibrium.

- To compare prices of otherwise identical goods some press publications regular show the prices of different goods across the world. The bet-known publication for this is the Economist's BigMac index, which shows the different prices of a BigMac from McDonald's and using the US Dollar as a basis, allows to compare the implied exchange rate and the actual exchange rate. This would allow to determine whether a currency is over-valued or under-valued; however it neglects other aspects that affect prices, such as taxes and other restrictions countries might impose.
- Similarly prices of meals from Kentucky Fried Chicken have been compared
- as well as the costs of an iPad by Apple.

- The idea is that exchange rates should adjust such that the prices of these homogeneous goods are identical across countries.
- The same idea applies to investment returns and we will look at how exchange rates should be determined to achieve these parities.

→ The use of parities is the most basic way to determine the long-run value of exchange rates.


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Parities
LIVERMORE
NEW YORK STOCK EXCHANGE

→ We will look at the purchasing power parity using prices in goods markets and the interest rate parity, which focusses on investments.

Equal outcomes across countries

- Parities ensure that purchasing goods abroad and making investments are yielding the same outcome
- They assume that prices and interest rates are given and only the exchange rate adjusts to avoid discrepancies

? How would transaction costs affect parities?

! Transaction costs would allow for a band the size of these transaction costs around the parity to be sustainable as these disparities cannot be successfully exploited by traders or investors

Equal outcomes across countries

→ We have seen that exchange rates should be set such that it makes no difference in which country a good is purchased or in which country and investment is made.

- If exchanges are determined by a parity it would be that the price of a good purchased at home si identical to that bought abroad and the return on investment is the same whether the investment is made at home or abroad.
- It is an implicit assumption in these models, that prices and interest rates are given and that the adjustment takes place through exchange rates. As we are interested in determining the exchange rate, these assumptions are reasonable.
- [?] Assume there are costs associated with the transfer of goods, such as transportation costs. For investments these might be taxes or similar charges that are levied. Can parities wtill be used to determine the exchange rate?
- [!] If prices or yields are different across countries, individuals might not be able to exploit these effectively. Thus prices and returns can differ from each other and hence exchange rates can deviate from their parities due to these transaction costs. The size of the possible deviation will be determined by the size of the transaction costs.

→ With parities we have now determined the long-term exchange rate, but we observe significant deviations that cannot be explained by transaction costs. We will therefore next look at reasons why exchange rates can deviate from parities, at least temporarily.

Money supply and sticky prices

- Central banks adjust money supply as part of their monetary policy and prices tend to adjust slowly
- If the economy is in full employment, this would not allow markets to clear
- We will see how the exchange rate can adjust quickly to ensure that markets clear

Money supply and sticky prices

→ We consider the impact the monetary policy decision of the central bank has on the economy in general and the exchange rate in particular.

- Central banks use the money supply as a tool in their monetary policy and we will be interested to see what impact the use of this tool has on exchange rates.
- We will make an assumption common in macroeconomics, namely that prices are only adjusting slowly to new macroeconomic conditions.

- If prices do not adjust quickly, and the economy cannot adjust their production, for example because we have full employment and an increase in production is not possible, then the economy would not be in equilibrium. If more money is available, then the demand for goods will exceed their supply and markets do not clear. The normal way would be for prices to adjust, thus increase, but it is assumed that prices are not instantly adjusting.
- We will propose that it is exchange rates, and hence the demand for good from overseas and the demand for our goods overseas, that will adjust quickly and ensure the economy is in equilibrium.

→ We will therefore develop a macroeconomic model that will look at such short-term deviations from the long-term equilibrium determined by parities.


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The effect of monetary shocks
LIVERMORE
NEW YORK STOCK EXCHANGE

→ Our model will allow us to look at the reaction of exchange rate to monetary policy decisions and how exchange rates 9and prices) slowly adjust to the long-term equilibrium.

Exchange rates clearing markets

- To clear markets, exchange rates overshoot the equilibrium price and re-adjust slowly with the wider economy afterwards
- The exchange rate is used to clear markets as it adjusts quickly, but this leads to volatile exchange rates

? Will exchange rates partially reverse previous changes necessarily be a sign of overshooting?

! The changes need to be seen in context, it could be the market overreacting to new information, but also to new (opposite) information becoming available.

Exchange rates clearing markets

→ we use exchange rates to clear markets until prices can adjust as well.

- We have seen that exchange rates overshoot the long-term equilibrium in order to ensure the goods and money market are both cleared.
  - As prices adjust slowly, the exchange rate reduces this overshoot and slowly falls back towards its long-term equilibrium.
- As prices are sticky, they cannot adjust quickly, but this adjustment to ensure the economy is in equilibrium, is left to the exchange rate.
  - Having the exchange rate take this adjustment, increases the volatility of exchange rates as they overshoot and then fall back.
- [?] You observe an exchange rate reversing its previous change, is this a sign of overshooting as we have discussed here?
- [!] While this is possible, there are other possible reasons why exchange rates reverse movements. Firstly, it might be the result of speculators taking positions ina currency and now reducing their positions, markets might not react correctly to any information they have been given, such as the size of the monetary shock or other (macroeconomic) variables that can affect exchange rates. In addition, as these adjustments take time, new information could arrive suggesting an opposite movement, or even a negative monetary shock as the central bank reverses the increase in money supply. Hence the model shown here only shows one possible reason for the observation, other reasons need to be evaluated and be ruled out.

→ We have seen that with exchange rates being able to adjust more quickly than prices to changed macroeconomic conditions, they will initially bear the brunt of any adjustments required to ensure the economy remains in equilibrium. This will lead to an overshoot of the exchange rate that is then slowly reversed as the wider economy adjusts.

Summary of key results

- Exchange rates should be set such that goods have identical prices across countries and investments yield the same returns
- As prices are slow to adjust to any shocks, the exchange rate will adjust quickly to clear markets at all times
- We can best interpret parities as the long-run equilibrium that exchange rates should achieve
- Due to exogenous shocks, for example from monetary policy, we might see temporary deviations from these parities

Summary of key results

→ We can now summarize the key results about the determination of exchange rates.

- We have seen that at least in the long run exchange rates should evolve such that goods have the same prices across countries
  - and investments in different countries should have the same returns.
- We have also seen that as a free market for most currencies exists, it can adjust quickly to new macroeconomic conditions, and will ensure markets are clearing and the economy is in equilibrium.
- These quick adjustments are then reversed as the other variables adjust and slowly the long-run equilibrium is reaches where parities should hold.
- These parities are rarely observed as exchange rates are disturbed by exogenous shocks, such as monetary policy, making the assessment of exchange rates more difficult.

→ Hence we see that on the long-run parities should hold, but these are disturbed by exchange rates being used as 'shock absorbers' for any macroeconomic shocks.

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