

Outline

- Arbitrage with goods and investment
- Purchasing power parity
- Interest rate parity
- Summary

- Arbitrage with goods and investment

► Currencies are exchanged if goods are traded across borders

Arbitrage with goods and investment

- ► Currencies are exchanged if goods are traded across borders
- ⇒ Such trade can be used to determine appropriate exchange rates

Arbitrage with goods and investment

- Currencies are exchanged if goods are traded across borders
- ⇒ Such trade can be used to determine appropriate exchange rates
- Currencies are exchanged if investments are made abroad

Arbitrage with goods and investment

- Currencies are exchanged if goods are traded across borders
- Such trade can be used to determine appropriate exchange rates
- Currencies are exchanged if investments are made abroad
- ⇒ Such investments can be used to determine appropriate exchange rates

Arbitrage with goods and investment

- Currencies are exchanged if goods are traded across borders
- Such trade can be used to determine appropriate exchange rates
- Currencies are exchanged if investments are made abroad
- ⇒ Such investments can be used to determine appropriate exchange rates

Arbitrage with goods and investment

International trade and investment faces substantial transaction costs

Parities

Arbitrage with goods and investment

- International trade and investment faces substantial transaction costs
- ► These transaction costs make foreign goods and investments not directly comparable

Parities

Arbitrage with goods and investment

- International trade and investment faces substantial transaction costs.
- ▶ These transaction costs make foreign goods and investments not directly comparable
- ► This will limit the applicability of theories based on such approaches

Arbitrage with goods and investment

- International trade and investment faces substantial transaction costs.
- ▶ These transaction costs make foreign goods and investments not directly comparable
- This will limit the applicability of theories based on such approaches

- Purchasing power parity

Copyright (by Andreas Krause

Parities

If goods are produced in two countries and they can be traded, the costs of purchasing them should be the same in both countries

- If goods are produced in two countries and they can be traded, the costs of purchasing them should be the same in both countries
- ▶ If prices were different, arbitrage could occur

- ▶ If goods are produced in two countries and they can be traded, the costs of purchasing them should be the same in both countries
- If prices were different, arbitrage could occur with a trader buying the goods in the country with the lower price

- If goods are produced in two countries and they can be traded, the costs of purchasing them should be the same in both countries
- If prices were different, arbitrage could occur with a trader buying the goods in the country with the lower price and selling it in the country with the higher price

- If goods are produced in two countries and they can be traded, the costs of purchasing them should be the same in both countries
- If prices were different, arbitrage could occur with a trader buying the goods in the country with the lower price and selling it in the country with the higher price
- Of course, the price of the goods will be priced in different currencies

- If goods are produced in two countries and they can be traded, the costs of purchasing them should be the same in both countries
- If prices were different, arbitrage could occur with a trader buying the goods in the country with the lower price and selling it in the country with the higher price
- Of course, the price of the goods will be priced in different currencies and the exchange rate needs to be applied to transform the prices of the domestic country into that of the foreign country
- $ightharpoonup P_t^* = e_t P_t$

- If goods are produced in two countries and they can be traded, the costs of purchasing them should be the same in both countries
- If prices were different, arbitrage could occur with a trader buying the goods in the country with the lower price and selling it in the country with the higher price
- Of course, the price of the goods will be priced in different currencies and the exchange rate needs to be applied to transform the prices of the domestic country into that of the foreign country
- $P_t^* = e_t P_t$
- ► This is known as the absolute purchasing power partity

Slide 7 of 17

- If goods are produced in two countries and they can be traded, the costs of purchasing them should be the same in both countries
- If prices were different, arbitrage could occur with a trader buying the goods in the country with the lower price and selling it in the country with the higher price
- Of course, the price of the goods will be priced in different currencies and the exchange rate needs to be applied to transform the prices of the domestic country into that of the foreign country
- $P_t^* = e_t P_t$
- ► This is known as the absolute purchasing power partity

Price levels across an economy are often difficult to compare due to the variety of goods produced

- Price levels across an economy are often difficult to compare due to the variety of goods produced
- We will instead compare inflation rates between countries

- Price levels across an economy are often difficult to compare due to the variety of goods produced
- ▶ We will instead compare inflation rates between countries
- Absolute purchasing power parity holds: $P_t^* = eP_t$

- Price levels across an economy are often difficult to compare due to the variety of goods produced
- We will instead compare inflation rates between countries
- lacktriangle Absolute purchasing power parity holds: $P_t^*=eP_t$

$$\Rightarrow \ln P_t^* = \ln e_t + \ln P_t$$

- Price levels across an economy are often difficult to compare due to the variety of goods produced
- We will instead compare inflation rates between countries
- Absolute purchasing power parity holds: $P_t^* = eP_t$
- $\Rightarrow \ln P_t^* = \ln e_t + \ln P_t$
- ▶ The same holds for the previous time period: $\ln P_{t-1}^* = \ln e_{t-1} + \ln P_{t-1}$

- Price levels across an economy are often difficult to compare due to the variety of goods produced
- ▶ We will instead compare inflation rates between countries
- Absolute purchasing power parity holds: $P_t^* = eP_t$
- $\Rightarrow \ln P_t^* = \ln e_t + \ln P_t$
- ▶ The same holds for the previous time period: $\ln P_{t-1}^* = \ln e_{t-1} + \ln P_{t-1}$
- $\Rightarrow \ln e_t \ln e_{t-1} = (\ln P_t^* \ln P_{t-1}^*) (\ln P_t \ln P_{t-1})$

- Price levels across an economy are often difficult to compare due to the variety of goods produced
- We will instead compare inflation rates between countries
- ▶ Absolute purchasing power parity holds: $P_t^* = eP_t$
- $\Rightarrow \ln P_t^* = \ln e_t + \ln P_t$
- ▶ The same holds for the previous time period: $\ln P_{t-1}^* = \ln e_{t-1} + \ln P_{t-1}$
- $\Rightarrow \ln e_t \ln e_{t-1} = \left(\ln P_t^* \ln P_{t-1}^*\right) \left(\ln P_t \ln P_{t-1}\right)$
- $\Rightarrow \Delta e_t = \pi_t^* \pi_t$

Copyright by Andreas Krause

- Price levels across an economy are often difficult to compare due to the variety of goods produced
- We will instead compare inflation rates between countries
- Absolute purchasing power parity holds: $P_t^* = eP_t$
- $\Rightarrow \ln P_t^* = \ln e_t + \ln P_t$
- ▶ The same holds for the previous time period: $\ln P_{t-1}^* = \ln e_{t-1} + \ln P_{t-1}$
- $\Rightarrow \ln e_t \ln e_{t-1} = \left(\ln P_t^* \ln P_{t-1}^* \right) \left(\ln P_t \ln P_{t-1} \right)$
- $\Rightarrow \Delta e_t = \pi_t^* \pi_t$

Copyright by Andreas Krause

Exchange rates adjusting to inflation

Parities

Exchange rates adjusting to inflation

▶ The change in the exchange rate should reflect the difference in inflation

Exchange rates adjusting to inflation

- ▶ The change in the exchange rate should reflect the difference in inflation
- A country experiencing higher inflation would see its currency devalue over time

Parities

Exchange rates adjusting to inflation

- ▶ The change in the exchange rate should reflect the difference in inflation
- A country experiencing higher inflation would see its currency devalue over time
- Not all goods are traded, many services need to be provided locally, if these are included in inflation, the purchasing power parity might not hold

Parities

Exchange rates adjusting to inflation

- ▶ The change in the exchange rate should reflect the difference in inflation
- A country experiencing higher inflation would see its currency devalue over time
- Not all goods are traded, many services need to be provided locally, if these are included in inflation, the purchasing power parity might not hold

Parities

- Arbitrage with goods and investment
- Purchasing power parity
- Interest rate parity
- Summary

Investors can invest into bonds in their home country or into bonds denominated in a different currency

- Investors can invest into bonds in their home country or into bonds denominated in a different currency
- Investing abroad involves exchanging their home currency for the foreign currency

- Investors can invest into bonds in their home country or into bonds denominated in a different currency
- Investing abroad involves exchanging their home currency for the foreign currency
- ▶ At the end of the investment, the investment is exchanged back into the domestic currency

- Investors can invest into bonds in their home country or into bonds denominated in a different currency
- Investing abroad involves exchanging their home currency for the foreign currency
- At the end of the investment, the investment is exchanged back into the domestic currency
- Investing abroad and overseas should yield the same outcome

- Investors can invest into bonds in their home country or into bonds denominated in a different currency
- Investing abroad involves exchanging their home currency for the foreign currency
- At the end of the investment, the investment is exchanged back into the domestic currency
- Investing abroad and overseas should yield the same outcome

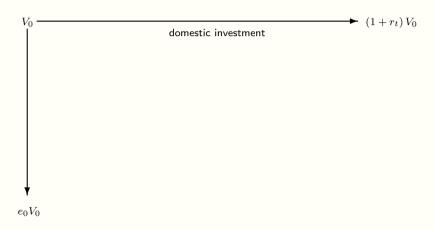
Copyright by Andreas Krause

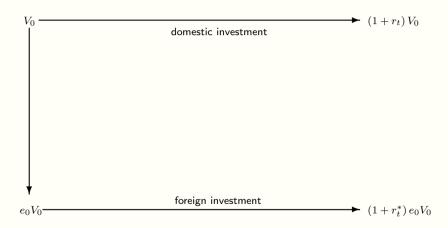
 V_0

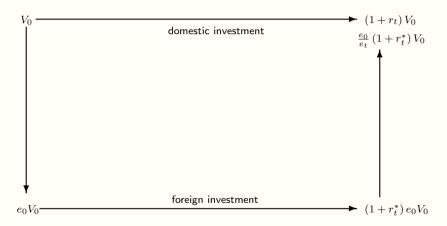


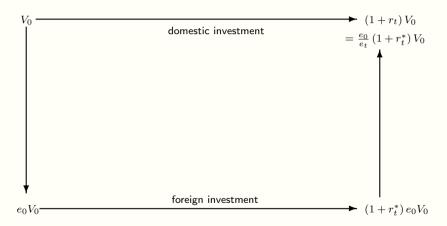


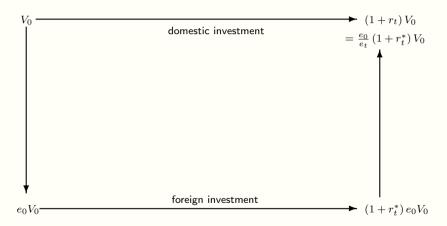
Parities











Copyright (by Andreas Krause

$$(1 + r_t) V_0 = \frac{e_0}{e_t} (1 + r_t^*) V_0$$

$$(1+r_t) V_0 = \frac{e_0}{e_t} (1+r_t^*) V_0$$

$$\Rightarrow \ln(1+r_t) = \ln e_0 - \ln e_t + \ln(1+r_t^*)$$

Interest rate parity 00000

Exchange rates and interest rate differentials

$$(1+r_t) V_0 = \frac{e_0}{e_t} (1+r_t^*) V_0$$

$$\Rightarrow \ln(1+r_t) = \ln e_0 - \ln e_t + \ln(1+r_t^*)$$

$$\Rightarrow r_t = -\Delta e_t + r_t^*$$

$$(1+r_t) V_0 = \frac{e_0}{e_t} (1+r_t^*) V_0$$

$$\Rightarrow \ln(1+r_t) = \ln e_0 - \ln e_t + \ln(1+r_t^*)$$

$$\Rightarrow r_t = -\Delta e_t + r_t^*$$

$$\Rightarrow \Delta e_t = r_t^* - r_t$$

$$(1+r_t) V_0 = \frac{e_0}{e_t} (1+r_t^*) V_0$$

$$\Rightarrow \ln(1+r_t) = \ln e_0 - \ln e_t + \ln(1+r_t^*)$$

$$\Rightarrow r_t = -\Delta e_t + r_t^*$$

$$\Rightarrow \Delta e_t = r_t^* - r_t$$

Exchanges rates reflect the difference in interest rates of the countries

- Exchanges rates reflect the difference in interest rates of the countries
- ▶ The exchange rate of the country with the higher interest rate should depreciate over time

- Exchanges rates reflect the difference in interest rates of the countries
- The exchange rate of the country with the higher interest rate should depreciate over time
- ► This result holds for the length to maturity of the bonds affected

- Exchanges rates reflect the difference in interest rates of the countries
- The exchange rate of the country with the higher interest rate should depreciate over time
- This result holds for the length to maturity of the bonds affected and could be used to forecast future exchange rate movements over long periods of times

- Exchanges rates reflect the difference in interest rates of the countries
- The exchange rate of the country with the higher interest rate should depreciate over time
- This result holds for the length to maturity of the bonds affected and could be used to forecast future exchange rate movements over long periods of times
- ► The interest rate parity implies that both investment have the same risk

- Exchanges rates reflect the difference in interest rates of the countries
- The exchange rate of the country with the higher interest rate should depreciate over time
- This result holds for the length to maturity of the bonds affected and could be used to forecast future exchange rate movements over long periods of times
- The interest rate parity implies that both investment have the same risk, but this can be adjusted to account for any differences in risk

- Exchanges rates reflect the difference in interest rates of the countries
- The exchange rate of the country with the higher interest rate should depreciate over time
- This result holds for the length to maturity of the bonds affected and could be used to forecast future exchange rate movements over long periods of times
- The interest rate parity implies that both investment have the same risk, but this can be adjusted to account for any differences in risk

- Summary

Exchange rates will take into account price changes in tradeable goods and different yields to investments in countries

- Exchange rates will take into account price changes in tradeable goods and different yields to investments in countries
- Purchasing power party and interest rate parity should both hold

- ► Exchange rates will take into account price changes in tradeable goods and different yields to investments in countries
- Purchasing power party and interest rate parity should both hold

International Fisher effect

- Exchange rates will take into account price changes in tradeable goods and different yields to investments in countries
- Purchasing power party and interest rate parity should both hold
- $\triangle e_t = \pi_t^* \pi_t = r_t^* r_t$

$$\Rightarrow r_t - \pi_t = r_t^* - \pi_t^*$$

International Fisher effect

- ► Exchange rates will take into account price changes in tradeable goods and different yields to investments in countries
- Purchasing power party and interest rate parity should both hold
- $\Rightarrow r_t \pi_t = r_t^* \pi_t^*$
- ► The real interest rates across countries have to equal

International Fisher effect

- ► Exchange rates will take into account price changes in tradeable goods and different yields to investments in countries
- Purchasing power party and interest rate parity should both hold
- $\Rightarrow r_t \pi_t = r_t^* \pi_t^*$
- ▶ The real interest rates across countries have to equal

Copyright (by Andreas Krause

► Information on inflation is only available with substantial delays

► Information on inflation is only available with substantial delays, making the forming of expectations necessary

- ► Information on inflation is only available with substantial delays, making the forming of expectations necessary
- Interest rates are affected by monetary policy decisions

- ► Information on inflation is only available with substantial delays, making the forming of expectations necessary
- ► Interest rates are affected by monetary policy decisions and these are linked to macroeconomic factors

- ► Information on inflation is only available with substantial delays, making the forming of expectations necessary
- ► Interest rates are affected by monetary policy decisions and these are linked to macroeconomic factors, including inflation

- ► Information on inflation is only available with substantial delays, making the forming of expectations necessary
- ▶ Interest rates are affected by monetary policy decisions and these are linked to macroeconomic factors, including inflation
- Such interdependencies, lack of information and monetary policy interventions limits the applicability of parities

- ► Information on inflation is only available with substantial delays, making the forming of expectations necessary
- ► Interest rates are affected by monetary policy decisions and these are linked to macroeconomic factors, including inflation
- Such interdependencies, lack of information and monetary policy interventions limits the applicability of parities



Copyright © by Andreas Krause

Cover: Tobias Deml. CC BY-SA 4.0 https://creativecommons.org/licenses/by-sa/4.0. via Wikimedia Commons. https://uoload.wikimedia.org/wikinedia/commons/2/26/Gaming-Wall-Street_BTS_Prodicium-266.jog Back: Michael Vadon, CC BY 2.0 | https://creativecommons.org/licenses/by/2.02, via Wikimedia Commons, https://upload.wikimedia.org/wikipedia/commons/9/97/Manhattan(NYC-New-York-City)Skyline(31769153946).jpg

Andreas Krause Department of Economics University of Bath Claverton Down Bath BA2 7AY United Kingdom

E-mail: mnsak@bath.ac.uk