

Andreas Krause

Swaps

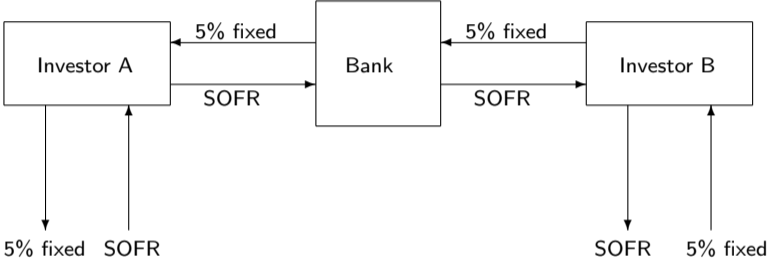
# Definition of swaps

- ▶ Swaps allow investors to exchange one payment flow for a different payment flow
- ▶ Only the differences in the payment flows are exchanged
- ▶ Swaps are all agreed with a bank and are bespoke in the specific terms
- ▶ Swaps are often long-term agreements
- ▶ Central banks also use swaps as part of their monetary policy
- ▶ The most common forms of swaps are interest rate swaps and currency swaps

# Interest rate swaps

- ▶ Interest rate swaps exchange payments on a fixed interest rate against that of a variable interest rate
- ▶ The fixed interest rate is derived from a long-term bond
- ▶ The variable interest rate is usually based on a benchmark interest rate, such as the Secured Overnight Financing Rate (SOFR)
- ▶ Investors use swaps to hedge their exposure to interest rates by matching incoming and outgoing payments

# Hedging with interest rate swaps



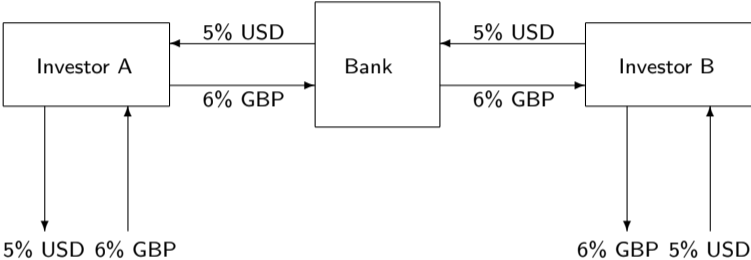
## Valuing interest rate swaps

- ▶ Value of the long-term fixed-rate bond is the present value of all future payments, discounted at the current long-term interest rate
- ▶ 
$$B_{\text{fix}} = \sum_{\tau=1}^T \frac{C_{\text{fix}}}{(1+r_{\text{fix}})^{\tau}} + \frac{B_0}{(1+r_{\text{fix}})^T}$$
- ▶ The variable bond will revert to its face value if the interest rate is adjusted to the market rate
- ▶ For the period to the next coupon payment the investor obtains interest, and this is discounted by the current short-term interest rate
- ▶ 
$$B_{\text{var}} = \frac{B_0 + C_{\text{var}} \Delta \tau}{(1+r_{\text{var}})^{\Delta \tau}}$$
- ▶ The swap value is the difference between these values:  $V = B_{\text{fix}} - B_{\text{var}}$

# Swap rate for interest rates

- ▶ The value of a swap can be positive or negative
- ▶ Whether a premium is to be paid, depends on the agreed conditions
- ▶ The fixed rate at which the swap has no value,  $V = 0$ , is referred to as the swap rate

# Hedging with currency swaps



## Valuing currency swaps

- ▶ Value of a bond in the domestic currency is the present value of all future payments, discounted at the current long-term interest rate
- ▶ 
$$B_{\text{domestic}} = \sum_{\tau=1}^T \frac{C_{\text{domestic}}}{(1+r_{\text{domestic}})^{\tau}} + \frac{B_0}{(1+r_{\text{domestic}})^T}$$
- ▶ Value of a bond in the foreign currency is the present value of all future payments, discounted at the current long-term interest rate
- ▶ 
$$B_{\text{foreign}} = \sum_{\tau=1}^T \frac{C_{\text{foreign}}}{(1+r_{\text{foreign}})^{\tau}} + \frac{B_0}{(1+r_{\text{foreign}})^T}$$
- ▶ The swap value is the difference between these values, adjusted for the exchange rate:  $V = B_{\text{domestic}} - eB_{\text{foreign}}$



# Swap rate for currencies

- ▶ The value of a swap can be positive or negative
- ▶ Whether a premium is to be paid, depends on the agreed conditions
- ▶ The exchange rate at which the swap has no value,  $V = 0$ , is referred to as the swap rate



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