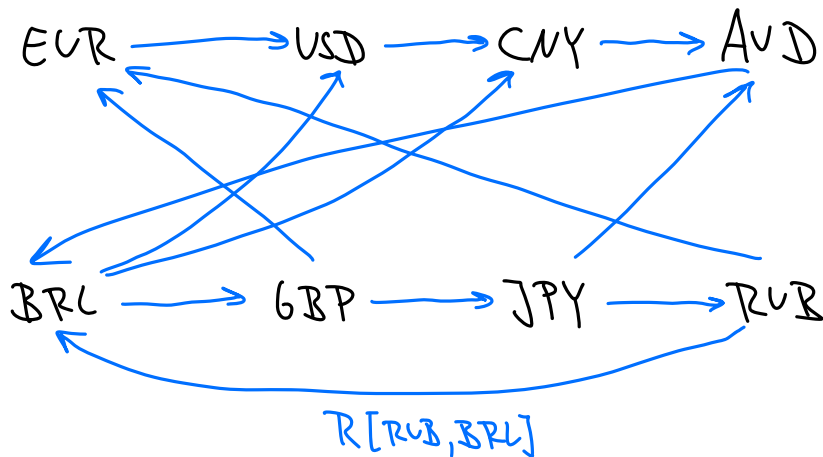
Another example: Currency exchange rates and arbitrage (= risk-free profit)

R[RUB, BRL]

Given: • list of currencies C

• list of exchange rates R[...,...]

• list of arcs A

Let us set up decision variables v_i = value of currency i, and a_{ij} = arbitrage for transaction $(i,j) \in A$.

Fix, e.g., $v[EUR] = 1$, so all currency values are relative to EUR.

$\underbrace{\qquad}_{\text{constraint}}$

Now normally $v_i R_{ij} = v_j$ (value from exchanging currency i to j = value of currency j), but maybe there is arbitrage. So our constraints are $v_i R_{ij} = v_j + a_{ij}$.

True values of currencies are obtained from minimizing arbitrage $z = \sum_{(i,j) \in A} a_{ij}$.

See pyomo code for an example.