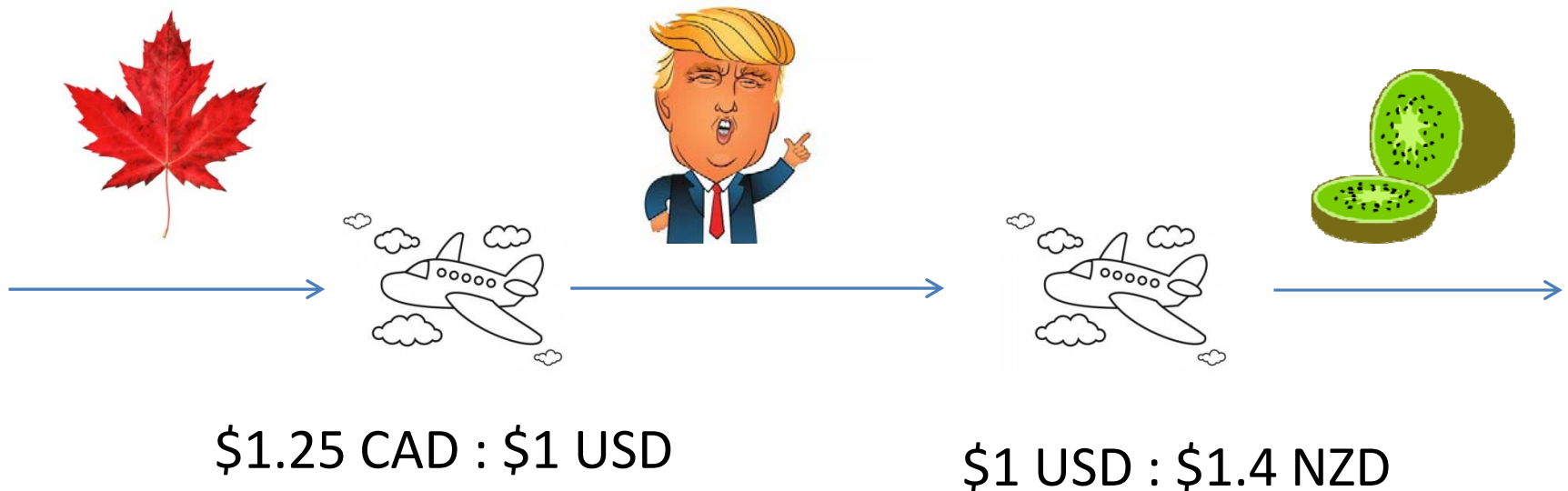


Per Unit analogy

- Suppose you are travelling with \$100 CAD (Student budget!) and the exchange rates are as follows:





- Tired of keeping track of the various dollar amounts in each country, you have decided to 'normalize' your money by dividing it by a 'base value'.
- As long as these base values are related by the exchange rate, you should have the same 'per unit' quantity in each country.

- If we choose: $\$CAD_{base} = \1.25
- Then $\$USD_{base} = \$CAD_{base} \times \$1/\$1.25 = \$1$
- Then $\$NZD_{base} = USD_{base} \times \$1.4/\$1 = \1.4



$$\begin{aligned}
 \$ \text{ pu} &= \$100 / \$CAD_{base} & \$ \text{ pu} &= \$80 / \$USD_{base} & \$ \text{ pu} &= \$110 / \$NZD_{base} \\
 &= 80 \text{ p.u. (No units)} & &= 80 \text{ p.u. (No units)} & &= 80 \text{ p.u. (No units)}
 \end{aligned}$$

- What if we choose: $\$CAD_{base} = \100
- Then $\$USD_{base} = \$CAD_{base} \times \$1/\$1.25 = \$80$
- Then $\$NZD_{base} = USD_{base} \times \$1.4/\$1 = \110



$$\begin{array}{lll}
 \$ pu = \$100 / \$CAD_{base} & \$ pu = \$80 / \$USD_{base} & \$ pu = \$110 / \$NZD_{base} \\
 = 1 \text{ p.u.} & = 1 \text{ p.u.} & = 1 \text{ p.u.}
 \end{array}$$

A few notes

- The first base value can be chosen arbitrarily. The other base values will be fixed based on the exchange rates.
- There is no 'inherent' information in the base quantity. i.e. it does not tell you how much money you have. We need to multiply the base value by the p.u. value to get the actual quantity.
- This was a one-dimensional problem. In power system, we deal with 4 dimensions (V,I,S,Z) that are all related by power equations.