

# Portfolio Theory

A portfolio is a collection of investments.

Ex 1      gold  
             silver  
             copper

Ex 2      1 - bedroom apartments  
             2 - "                                "  
             3 - "                                "

## Notation

Let  $n$  = no of investments

Let  $X_1$  = Loss on investment 1  
 $X_2$  = "        "                                "        2  
 $X_3$  = "        "                                "        3  
          :  
 $X_n$  = "        "                                "         $n$

The 6 possible cases

- 1)  $X_1, \dots, X_n$  are IID &  $n$  is fixed
- 2)  $X_1, \dots, X_n$  are IID &  $n$  is a RV
- 3)  $X_1, \dots, X_n$  are INID (independent but not identically distributed) and  $n$  is fixed
- 4)  $X_1, \dots, X_n$  are INID and  $n$  is a RV
- 5)  $X_1, \dots, X_n$  are dependent RVs &  $n$  is fixed
- 6)  $X_1, \dots, X_n$  are dependent RVs &  $n$  is a RV

## Variables of Interest

$$\begin{aligned} \text{a) } S^l &= X_1 + X_2 + \dots + X_n \\ &= \text{Total portfolio loss} \end{aligned}$$

$$\begin{aligned} \text{b) } U &= \min(X_1, \dots, X_n) \\ &= \text{minimum portfolio loss} \end{aligned}$$

$$\begin{aligned} \text{c) } V &= \max(X_1, \dots, X_n) \\ &= \text{maximum portfolio loss} \end{aligned}$$