Video 1: Welcome to the course

- Is investing a monkey-business?

http://www.theglobeandmail.com/report-on-business/rob-magazine/three-reasons-a-monkey-is-a-better-investor-than-you/article14021500/

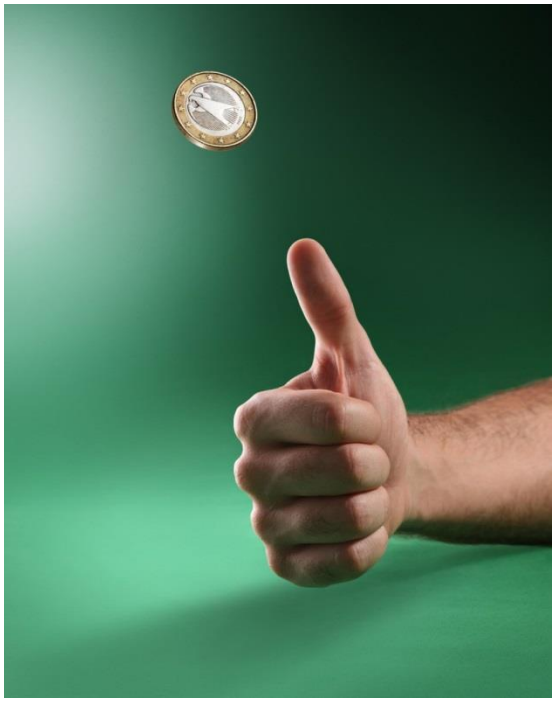
- Professor of finance
- Advisor to investment companies
  - Expertise in portfolio management
  - Focus on risk management.

- Simple tricks to avoid large losses:
  - Carefully selected diversfied portfolios;
  - Backtesting and online monitoring of performance
- Learn this by doing at Datacamp!

- Ch. 1 Portfolio weights and returns
- Ch. 2 Porfolio performance evaluations
- Ch. 3 Drivers of performance
- Ch. 4 Portfolio optimization

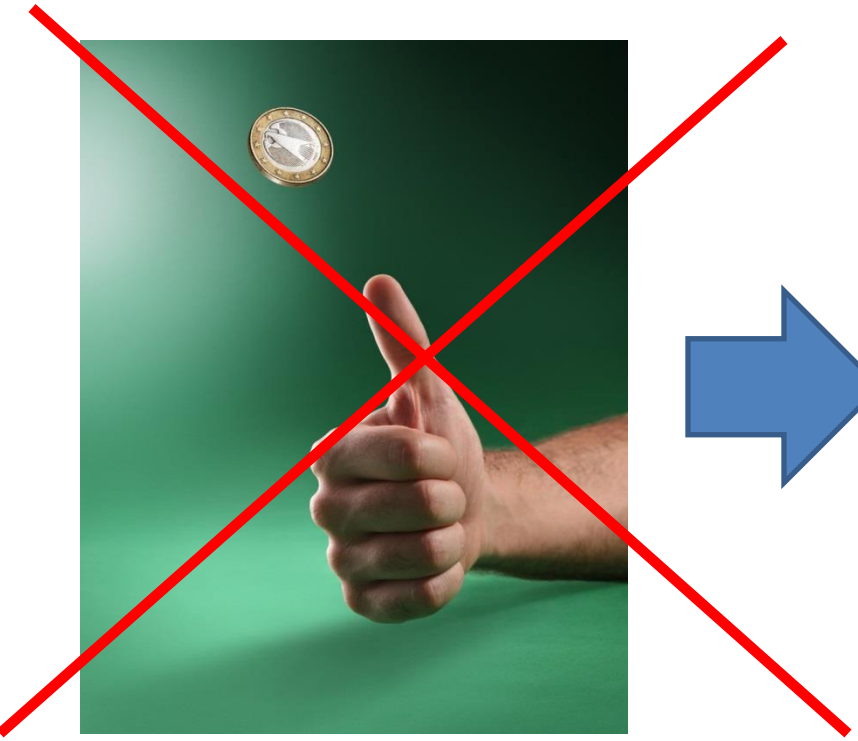
Video 2: The portfolio weights

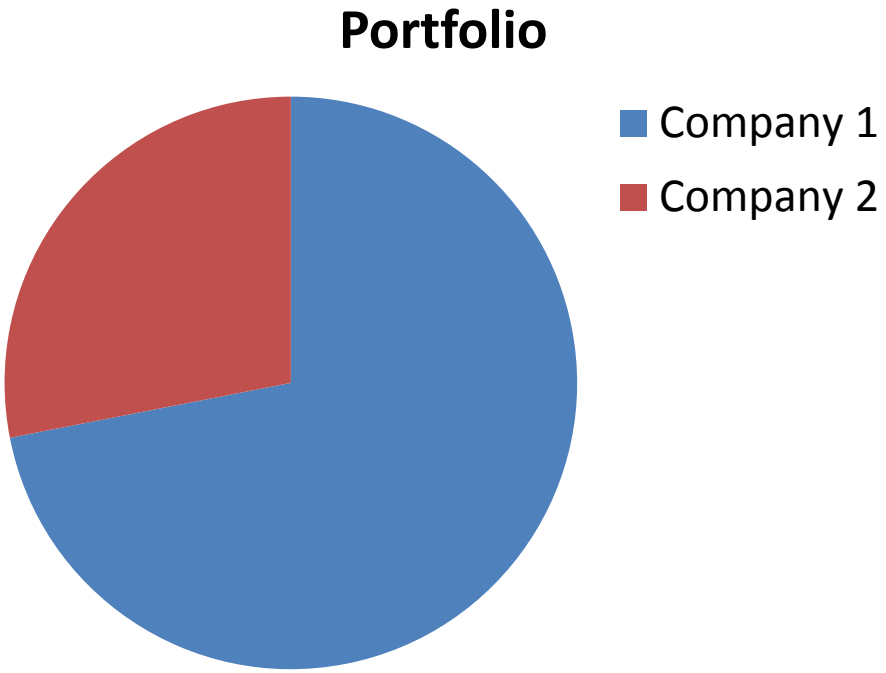
- Two similar companies: Invest in either of them based on tossing a coin?



http://hubpages.com/education/Coin-Tossing-How-Random-Is-It

- Two similar companies: Invest in either of them based on tossing a coin?

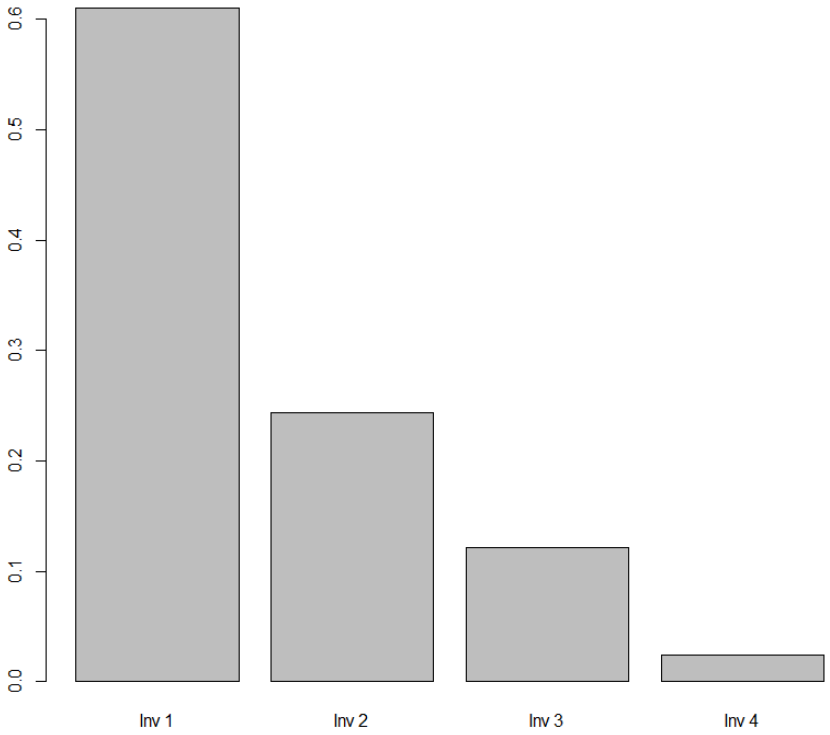




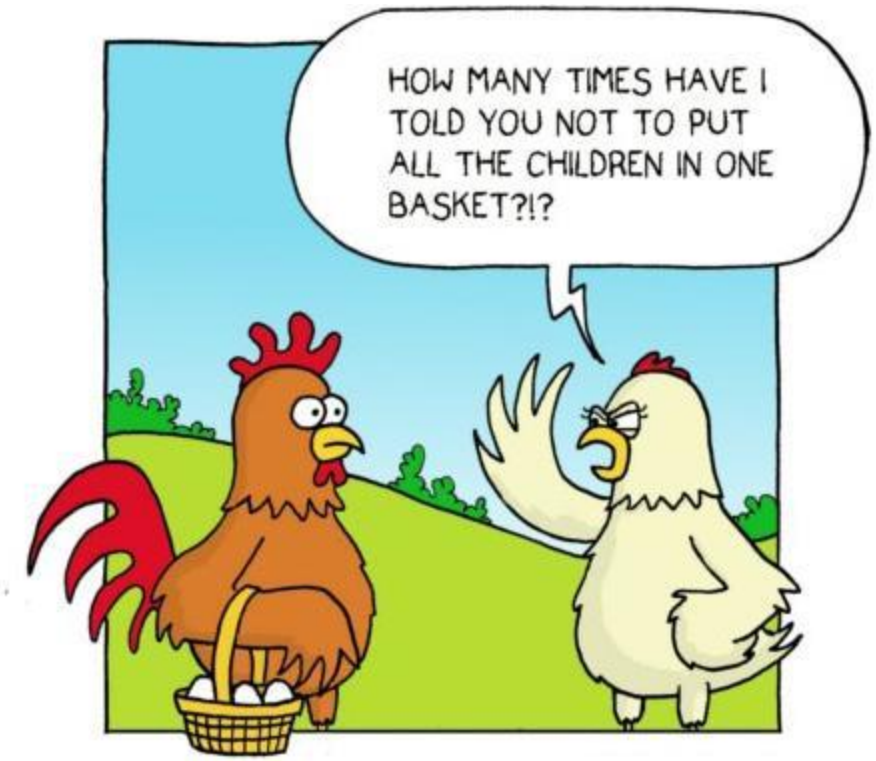
Portfolio weights

Investment	Value invested	Weight
1	V_1	$w_1 = \frac{V_1}{V_1 + \cdots + V_N}$
2	V_2	$w_2 = \frac{V_2}{V_1 + \cdots + V_N}$
* * *		
N	V_N	$w_N = \frac{V_N}{V_1 + \cdots + V_N}$

```
values <- c(500000, 200000, 100000, 20000)
names(values) <- c("Inv 1","Inv 2","Inv 3","Inv 4")
weights <- values/sum(values)
barplot(weights)
```



- Allocation strategies
  - Optimize mean and variance (chapter 4)
  - Betting on one asset;
  - Equal weighting of a diversified set of assets;
  - Market capitalization based weighting
  - …



http://www.falibo.com/vocabulary/idiom-dont-put-all-your-eggs-in-one/

Video 3: The portfolio return

- Weights reveal active investment bets;
- Returns are the relative changes in value:

$$\frac{final\ value\ -initial\ value}{initial\ value}$$

Initial value	100
Final value	120

$$\frac{120-100}{100}=20\%$$

Inv 1	Inv 2	…	Inv N	Porfolio total
In.Val.1	In.Val.2	…	In.Val.N	Initial Portfolio Value = In.Val.1 +In.Val.2 +….+In.Val.N
Fin.Val.1	Fin.Val.2	…	Fin.Val.N	Final Portfolio value = Fin.Val.1 +Fin.Val.2 +….+Fin.Val.N

$$Portfolio\ Return = \frac{final\ portfolio\ value\ - initial\ portfolio\ value}{initial\ portfolio\ value}$$

	Inv 1	Inv 2	Porfolio total
Initial	$200	$300	$500
Final	$180	$330	$510

$$Portfolio\ Return = \frac{510-500}{500} = 2\%$$

- New formula

$$Portfolio\ Return = \frac{final\ portfolio\ value\ - initial\ portfolio\ value}{initial\ portfolio\ value}$$

$$= w_1r_1+w_2r_2+\ldots w_Nr_N$$

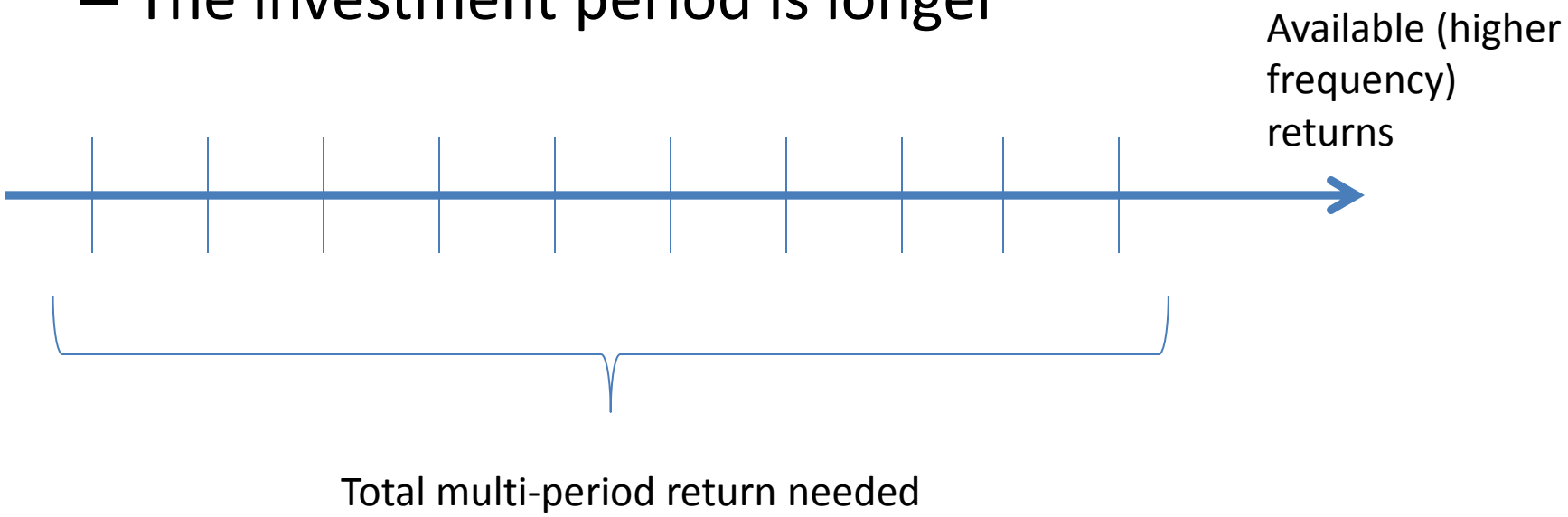
Inv 1	Inv 2	…	Inv N	Porfolio total
In.Val.1	In.Val.2	…	In.Val.N	Initial Portfolio Value
Fin.Val.1	Fin.Val.2	…	Fin.Val.N	Final Portfolio value

Inv 1	Inv 2	…	Inv N
w1= In.Val.1/Initial Portfolio Value	In.Val.2	…	In.Val.N
R1=	Fin.Val.2	…	Fin.Val.N

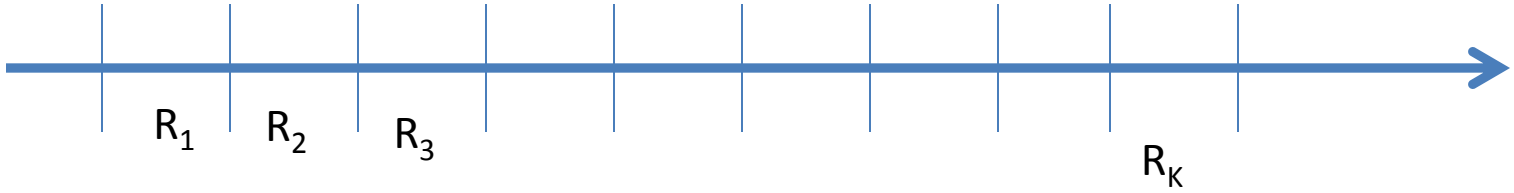
- Simple example with 2 assets

Video 4: The PerformanceAnalytics package

- A common mismatch:
  - Returns are available at a daily, weekly or monthly frequency
  - The investment period is longer



- Compounding formula



- Initial value: Vi
- Value after:
  - One period: $Vi(1+R_1)$
  - Two periods: $Vi(1+R_1)(1+R_2)$
  - …
  - K periods: $Vi(1+R_1)(1+R_2)…(1+R_K)$

Multiperiod return

- Initial value: Vi
- Value after K periods: $Vi(1+R_1)(1+R_2)\ldots(1+R_K)$

- Hence the k-period return:

$$R[k] = \frac{Vi(1+R_1)(1+R_2)\ldots(1+RK) - Vi}{Vi}$$

$$= (1+R_1)(1+R_2)\ldots(1+RK) - 1$$

```
returns <- c( 0.05 , -0.01 , 0.03 , 0.02 , 0.01 )
cumprod(1+returns)
[1] 1.050000 1.039500 1.070685 1.092099 1.103020
tail(cumprod(1+returns),1)-1
[1] 0.1030197
```

- Let us now consider a realistic portfolio of stocks, invested in 30 large US firms, namely the stocks included in the Dow Jones Industrial Average universe:

[show tickers]

- For those thirty stocks, the variable ‘prices’ provides us the end-of-month close adjusted prices over the period December 1990 till December 2015

R Console

```
> head(prices,1)
                AA     AAPL      AXP       BA      BAC      CAT      CVX
1990-12-31 4.534478 1.345204 3.445906 13.77601 2.740819 3.259666 7.440307
                DD      DIS      GE       HD      HPQ     INTC      IBM
1990-12-31 7.68017 6.428398 2.35596 2.042869 1.004518 0.841387 18.27009
               JNJ      JPM       KO      MCD      MMM      MRK     MSFT
1990-12-31 5.103177 1.651136 3.398343 4.583788 10.70052 6.468881 0.723928
               NKE      PFE       PG      TRV      UTX       VZ      WMT
1990-12-31 1.024851 1.674406 5.991295 7.683583 3.471237 7.835626 5.455634
               XOM       T
1990-12-31 6.233811 4.64325
> tail(prices,1)
                AA     AAPL     AXP       BA     BAC      CAT      CVX
2015-12-31 9.827518 104.6919 68.9133 143.2643 16.7662 67.11964 88.83326
                DD    DIS       GE       HD      HPQ     INTC      IBM
2015-12-31 66.17163 105.08 30.90261 131.5268 11.70868 34.14943 136.2285
               JNJ      JPM       KO      MCD      MMM      MRK    MSFT
2015-12-31 101.9809 65.10796 42.62756 117.2517 149.5594 52.36191 55.0845
               NKE     PFE       PG      TRV      UTX       VZ      WMT
2015-12-31 62.33928 31.9587 78.72384 112.2365 95.35903 45.18148 60.84953
               XOM        T
2015-12-31 77.24887 33.51689
```

- Returns

R Console

Click or Press Ctrl+2 to focus

```
> returns <- CalculateReturns(prices,method="simple")
> head(returns)
                   AA        AAPL         AXP          BA         BAC
1990-12-31         NA          NA          NA          NA          NA
1991-01-31  0.128181899  0.29069717  0.10302951  0.08815424 0.22950841
1991-02-28 -0.003884696  0.03370538  0.05494594 -0.01808654 0.03999988
1991-03-31  0.021443165  0.18777315  0.20312426 -0.02590673 0.19835795
1991-04-30  0.037425309 -0.19117668 -0.12724754 -0.02659574 0.06498192
1991-05-31  0.053703048 -0.14326469  0.02500053  0.07676566 0.14237304
```

- Returns

```
> returns <- CalculateReturns(prices,method="simple")
> returns <- returns[(-1),]
> head(returns)
                    AA        AAPL         AXP          BA         BAC
1991-01-31  0.128181899  0.29069717  0.10302951  0.08815424  0.22950841
1991-02-28 -0.003884696  0.03370538  0.05494594 -0.01808654  0.03999988
1991-03-31  0.021443165  0.18777315  0.20312426 -0.02590673  0.19835795
1991-04-30  0.037425309 -0.19117668 -0.12724754 -0.02659574  0.06498192
1991-05-31  0.053703048 -0.14326469  0.02500053  0.07676566  0.14237304
1991-06-30 -0.050966017 -0.11702172 -0.11308280 -0.06632650 -0.14381507
```