Attendance

Discounting Factor

The discount factor captures the extent to which the future value will be discounted to the present value (PV)

$100 today > $100 in a year

CLV Calculation: Discounting

Future cash flow has smaller current value

CLV Calculation: Discounting

Given the discount rate, present value can be calculated as

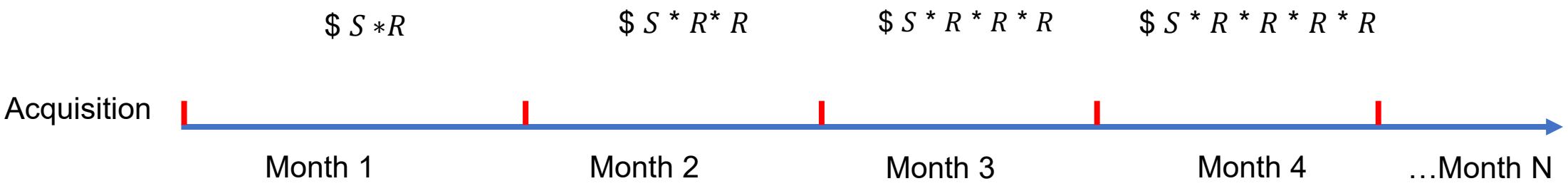
$$Discount\ Rate = \frac{Future\ Value}{Present\ Value} - 1$$

$$Present\ Value = \frac{Future\ Value}{Discount\ Rate + 1}$$

Lecture 4

CLV Calculation: Discounting

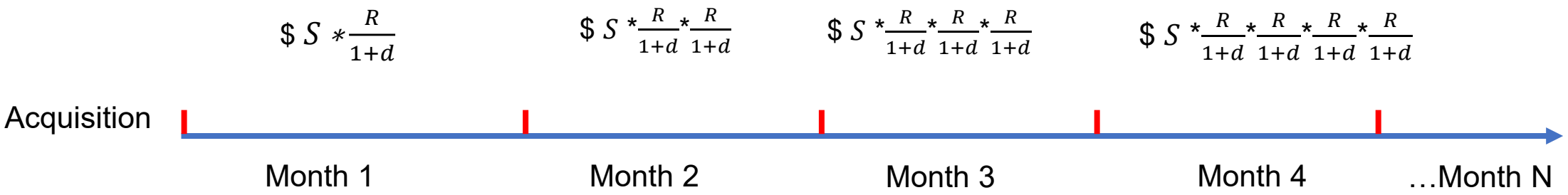
Assume the discount rate as d



$$S * R + S * R * R + S * R * R * R + \dots + S\,R^N$$

CLV Calculation: Discounting

Assume the discount rate as d



$$\$ S * \frac{R}{1+d} + \$ S * \frac{R}{1+d} * \frac{R}{1+d} + \$ S * \frac{R}{1+d} * \frac{R}{1+d} * \frac{R}{1+d} + \cdots + S\left(\frac{R}{1+d}\right)^{N}$$

CLV Calculation: Discounting

Full derivation

$$\sum_{n=1}^{N} S\left(\frac{R}{1+d}\right)^n = S\frac{R}{1+d}^1 + S\frac{R}{1+d}^2 + S\frac{R}{1+d}^3 + \cdots + S\frac{R}{1+d}^N$$

$$= S\left(\frac{R}{1+d}^1 + \frac{R}{1+d}^2 + \frac{R}{1+d}^3 + \cdots + \frac{R}{1+d}^N\right)$$

$$= S\frac{\left(\frac{R}{1+d}^1 + \frac{R}{1+d}^2 + \frac{R}{1+d}^3 + \cdots + \frac{R}{1+d}^N\right)\left(1 - \frac{R}{1+d}\right)}{1 - \frac{R}{1+d}}$$

$$= S\frac{\frac{R}{1+d} - \frac{R}{1+d}^2 + \frac{R}{1+d}^2 - \frac{R}{1+d}^3 + \frac{R}{1+d}^3 + \cdots - \frac{R}{1+d}^N + \frac{R}{1+d}^N - \frac{R}{1+d}^{N+1}}{1 - \frac{R}{1+d}}$$

$$= S\frac{\frac{R}{1+d} - \frac{R}{1+d}^{N+1}}{1 - \frac{R}{1+d}} \qquad = S\frac{R - \frac{R^{N+1}}{(1+d)^N}}{1+d-R} \qquad \approx S\frac{R}{1+d-R}$$

CLV Calculation: Calculation Example

Let's consider the following case:

- Monthly margin: $1000
- Retention rate per month: 90%
- Discount rate per month: 10%

What is the customer lifetime value?

$$S\frac{R}{1-R}=1000*\frac{90\%}{1-90\%}=9000$$

$$S\frac{R}{1-R}=1000*\frac{90\%}{1+10\%-90\%}=4500$$

CLV Calculation: Calculation Example

Let’s consider the following case:

- Monthly margin: $1000
- Retention rate per week: 96%
- Discount rate per week: 4%

CLV Calculation: Marketing Efforts

However consumers' spending and return are influenced by marketing efforts

CLV Calculation: Marketing Efforts

Let's assume that firms' promotion spending is p

Let's assume that consumers' margin is a function of p

$$S = S_0 + \alpha * p$$

CLV Calculation: Marketing Efforts

Let's assume that firms' promotion spending is p

Let's assume that consumers' margin is a function of p

$$S = S_0 + \alpha * p$$

For example

$$S = 40 + 2 * p$$

CLV Calculation: Marketing Efforts

Let's assume that firms' promotion spending is p

Let's assume that consumers' margin is a function of p

$$S = S_0 + \alpha * p$$

For example

$$S = 40 + 2 * p$$

$S = 42$ when $p = 1$

$S = 44$ when $p = 1$

CLV Calculation: Marketing Efforts

We can now express CLV as a function of promotion spending

$$CLV = (S_0 + \alpha * p)\frac{R}{1 + d - R}$$

How can we make use of it?

CLV Calculation: Marketing Efforts

We can use the CLV to derive optimal promotion

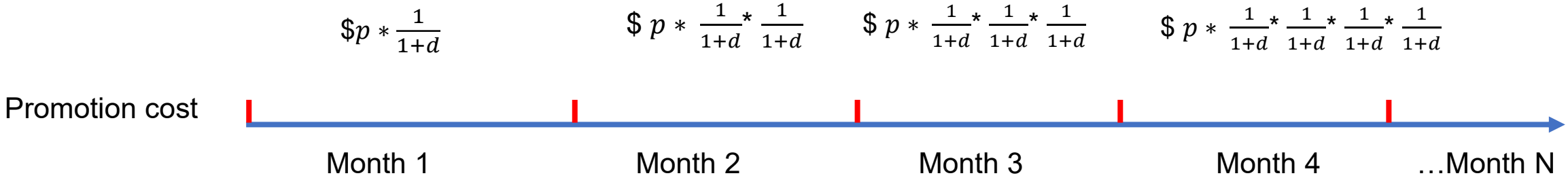
$$CLV = (S_0 + \alpha * p)\frac{R}{1 + d - R}$$

CLV Calculation: Marketing Efforts

We previously assume that consumers' spending and retention are as given

$$CLV = (S_0 + \alpha * p)\frac{R}{1 + d - R} -$$

$$\sum_{n=1}^{N} p(\frac{1}{1+d})^n$$



CLV Calculation: Marketing Efforts

Calculate the marketing efforts

$$\sum_{n=1}^{N} p\left(\frac{1}{1+d}\right)^n = p\left(\frac{1}{1+d}^1 + \frac{1}{1+d}^2 + \frac{1}{1+d}^3 + \cdots + \frac{1}{1+d}^N\right)$$

$$= p\frac{\frac{1}{1+d} - \frac{1}{1+d}^{N+1}}{1 - \frac{1}{1+d}}$$

$$= p\frac{1 - \frac{1}{1+d}^N}{\mathrm{d}}$$

$$= p\frac{1}{\mathrm{d}}$$

CLV Calculation: Marketing Efforts

We will have the net value as

$$CLV = (S_0 + \alpha * p)\frac{R}{1 + d - R} - \frac{p}{\mathrm{d}}$$

CLV Calculation: Calculation Example

Let's consider the following case:

- Monthly margin: $1000
- Retention rate per month: 90%
- Discount rate per month: 10%
- Promotion return α: 2

Suppose you can invest $100 per month vs $200 per month, which one is better?

CLV Calculation: Marketing Efforts

Let's assume that firms' customer relationship management spending is q

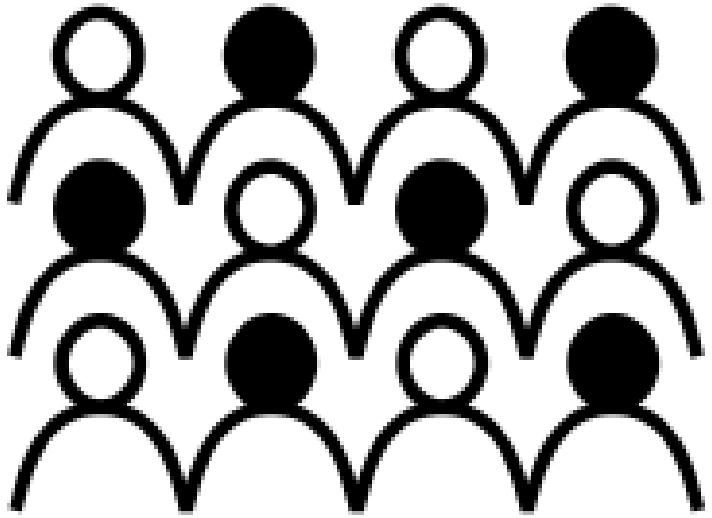
Let's assume that consumers' return rate is a function of q

$$R = R_0 + \beta * q$$

Please derive the net value

CLV Calculation: Heterogeneity

Consumers are very different



CLV Calculation: Heterogeneity

Within the CLV equation, what can be different across consumers?

$$CLV \approx S \frac{R}{1 + d - R}$$

CLV Calculation: Heterogeneity

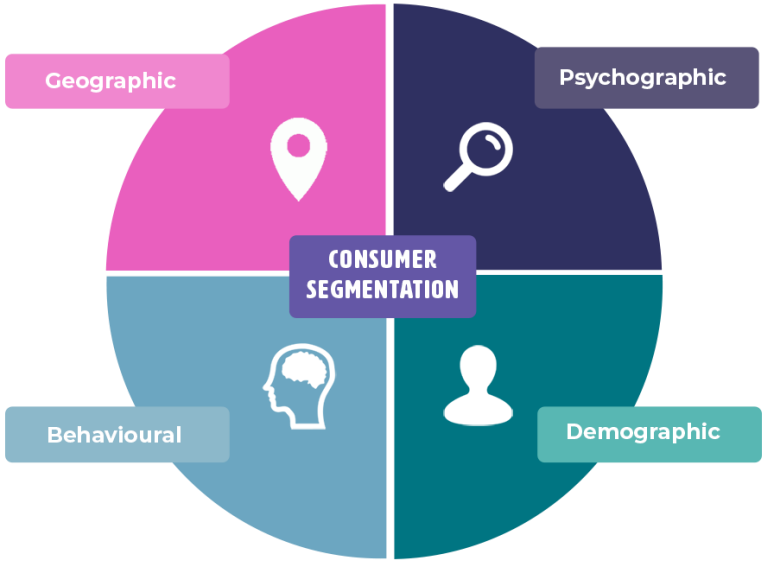
Within the CLV equation, what can be difference across consumers?

- Margin can be different
- Retention rate can be different

$$CLV \approx S \frac{R}{1 + d - R}$$

CLV Calculation: Heterogeneity

We can infer consumers' heterogeneity from observed characteristics



CLV Calculation: Heterogeneity

An example of heterogeneity: online dating market

CLV Calculation: Heterogeneity

We can use this heterogeneity to do segmentation, targeting, and positioning