Lab9 – Testing for the effects of variables

Time effects

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Time effects

Q: Is the mean response varying with time?

$$E[Y_{ij}] = \beta_0 + \beta_1 X_{ij1} + \beta_2 X_{ij2} + \beta_3 X_{ij3} + \cdots + \beta_{11} X_{ij11}$$

where Xij1, Xij2, and Xij11 are indicator variables for age 4, 5, 6, …15 days

Random efect

```
lin_age <- lmer(weight ~ measurement + (1 | Id), data = data_dog_weight)

summary(lin_age)
```

Time effects

Fixed effects:

	Estimate	Std. Error	df	t value	Pr(>|t|)	
(Intercept)	388.10 β_0	34.43	23.69	11.273	5.28e-11	***
measurementday2	51.80	16.48	209.00	3.143	0.00192	**
measurementday3	110.20	16.48	209.00	6.686	2.05e-10	***
measurementday4	173.20	16.48	209.00	10.509	< 2e-16	***
measurementday5	227.40	16.48	209.00	13.798	< 2e-16	***
measurementday6	297.45	16.48	209.00	18.048	< 2e-16	***
measurementday7	353.50	16.48	209.00	21.448	< 2e-16	***
measurementday8	397.85	16.48	209.00	24.140	< 2e-16	***
measurementday9	500.15	16.48	209.00	30.350	< 2e-16	***
measurementday910	568.95	16.48	209.00	34.520	< 2e-16	***
measurementday911	650.80	16.48	209.00	39.488	< 2e-16	***
measurementday912	728.40	16.48	209.00	44.196	< 2e-16	***

β_1 = The difference between the mean responses of day 2 and day 1

β_2 = The difference between the mean responses of day 3 and day 2

β_3 = The difference between the mean responses of day 4 and day 3

Time effects

- Next we can test whether the mean response is constant over time by testing the null hypothesis that all the regression coefficients used to model time are simultaneously equal to zero (H0:β1=β2=β3=0)

```
Anova(lin_age)
```

```
Analysis of Deviance Table (Type II Wald chisquare tests)

Response: weight
            Chisq Df Pr(>Chisq)
measurement 4585.6 11  < 2.2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

the trajectory of the mean response over time is not flat

Graphical representation of the trend