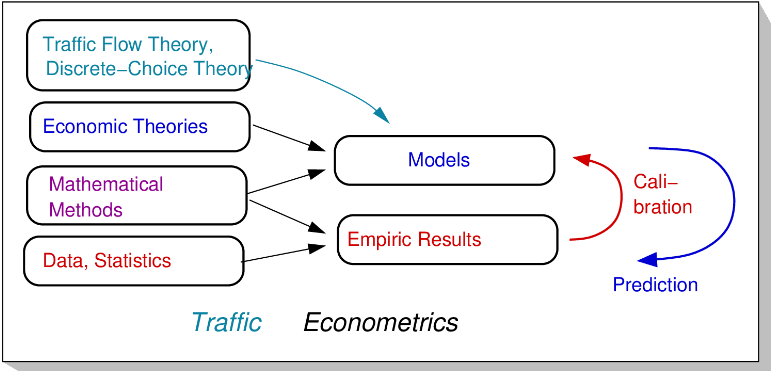
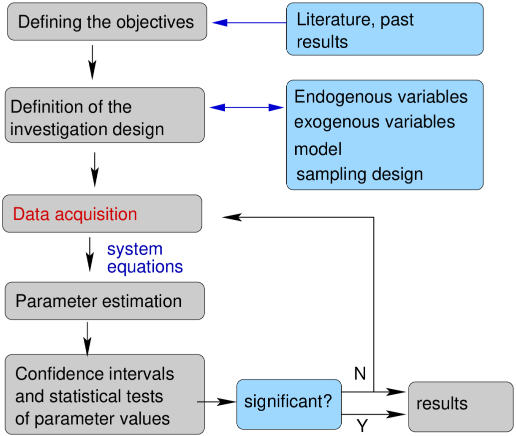
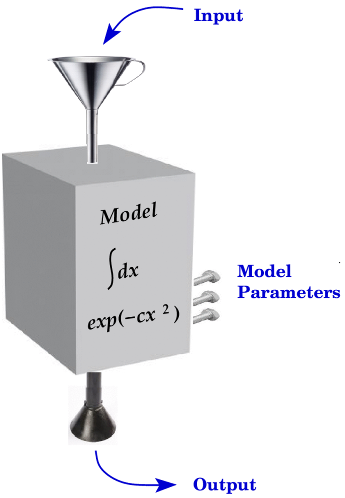
Scope of econometrics – from a mathematical point of view

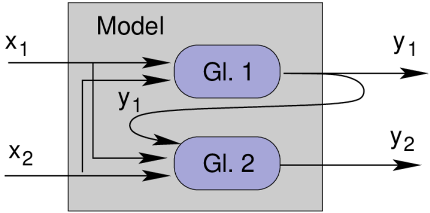


General procedure of an econometric analysis

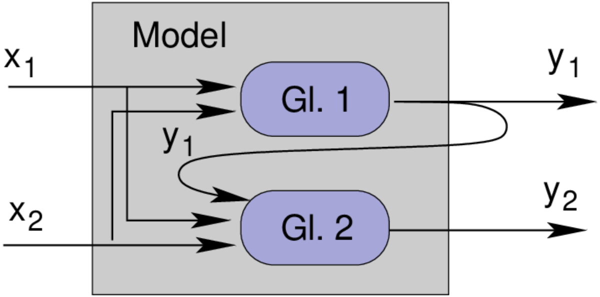


Information flow of an econometric model

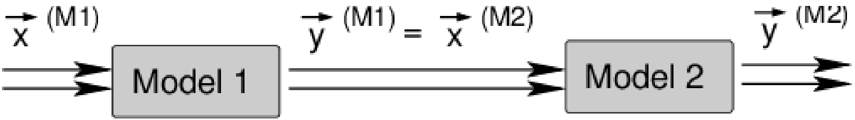


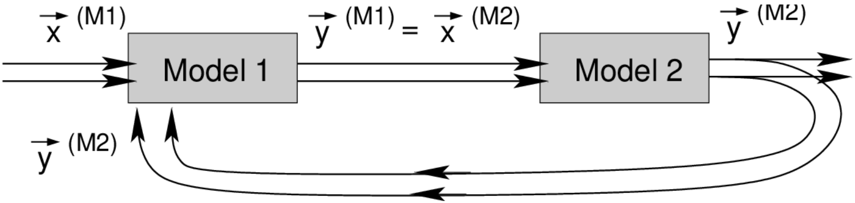


Linking

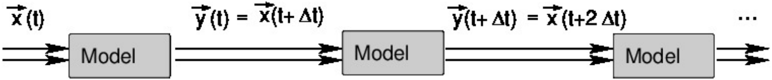


Chaining and feedback





Models of time evolution ("dynamic models")



- Special case of chaining: The endogenous variables at time t are the exogenous variables at the next time step $t + \Delta t$
- The model itself is generally the same in all steps
- Sometimes, however, it has time dependent parameters (*non-autonomous* model)

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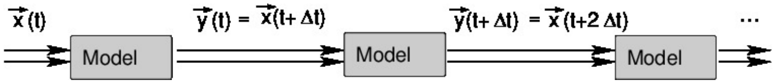

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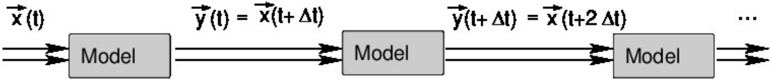

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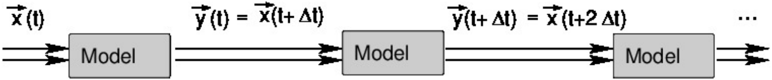

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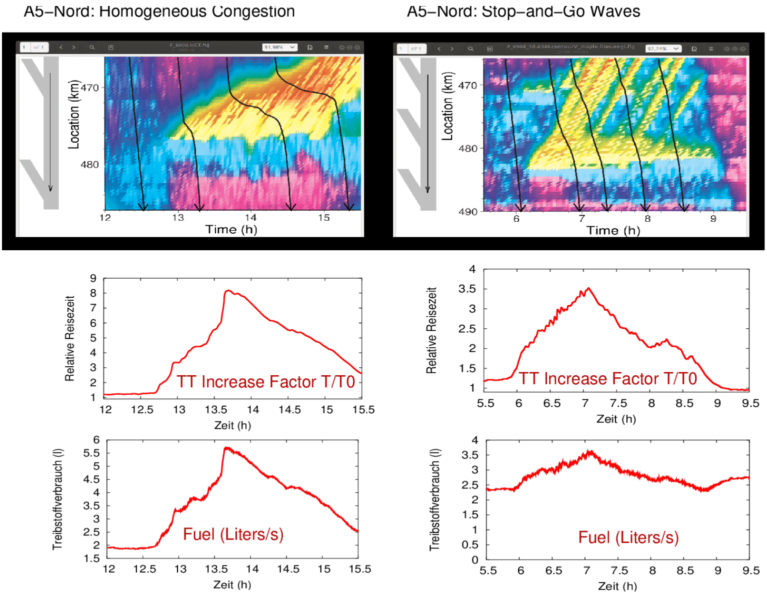
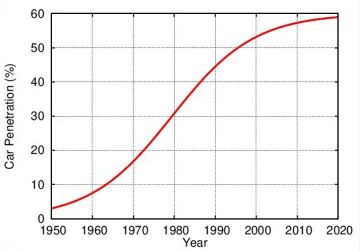
Application: Calculating the external costs of road traffic

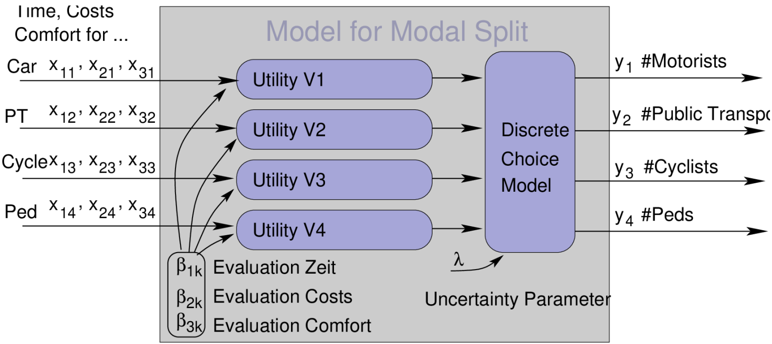


Model for limited growth



Limited growth according to the solution of the differential equation $\frac{\mathrm{d}y}{\mathrm{d}t} = \frac{1}{\tau}\left(1 - \frac{y(t)}{y_s}\right)$ for the initial value $y_0 = 3$ at the moment in time $t_0 = 1950$ and the model parameters growth time constant $\tau = 10$ and saturation $y_s = 60$. The result might represent the penetration rate for passenger cars per person in %.

Structure of a modal split model



- Exogenous variables x_{kj}: influencing factors j for mode k
- Endogenous variables y_k: frequency of utilization for mode k

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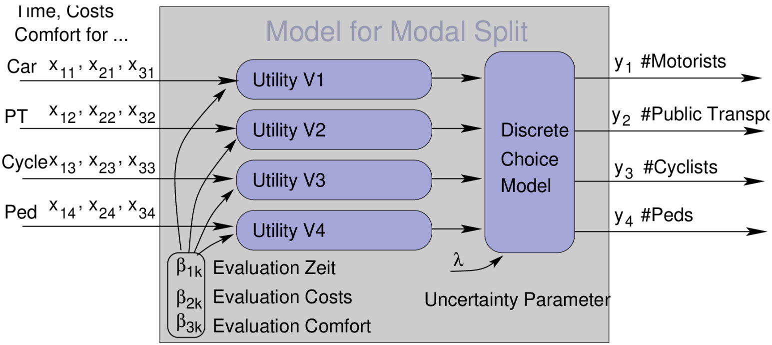

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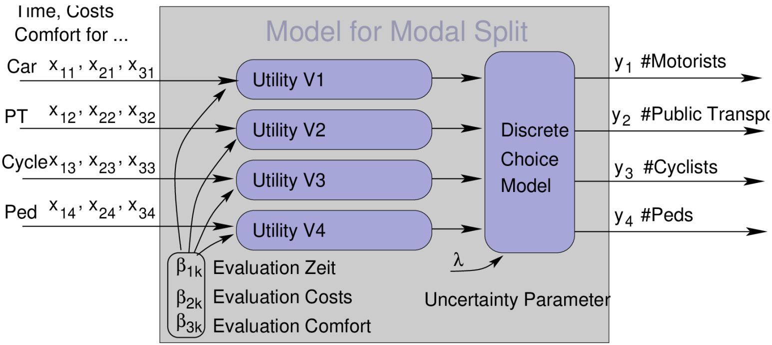

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Mode choice for two alternatives: by bike or by public transport (PT)

	Age	Sex	time needed bike	costs bike	total travel time PT	costs PT	choice bike	choice PT
Variables	x_1	x_2	x_3	x_4	x_5	x_6	y_{1i}	y_{2i}
Person 1	30	w	20 min	0 €	30 min	1.00 €	0	1
Person 2	24	m	11 min	0 €	20 min	2.00 €	1	0
Person 3	27	m	34 min	0 €	15 min	2.00 €	0	1
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮

These data can be obtained from interviews.