SEASONALITY OF PRICES - THE EXAMPLE OF GERMAN TIMBER PRICES

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STRUCTURE

(1) The German round wood price

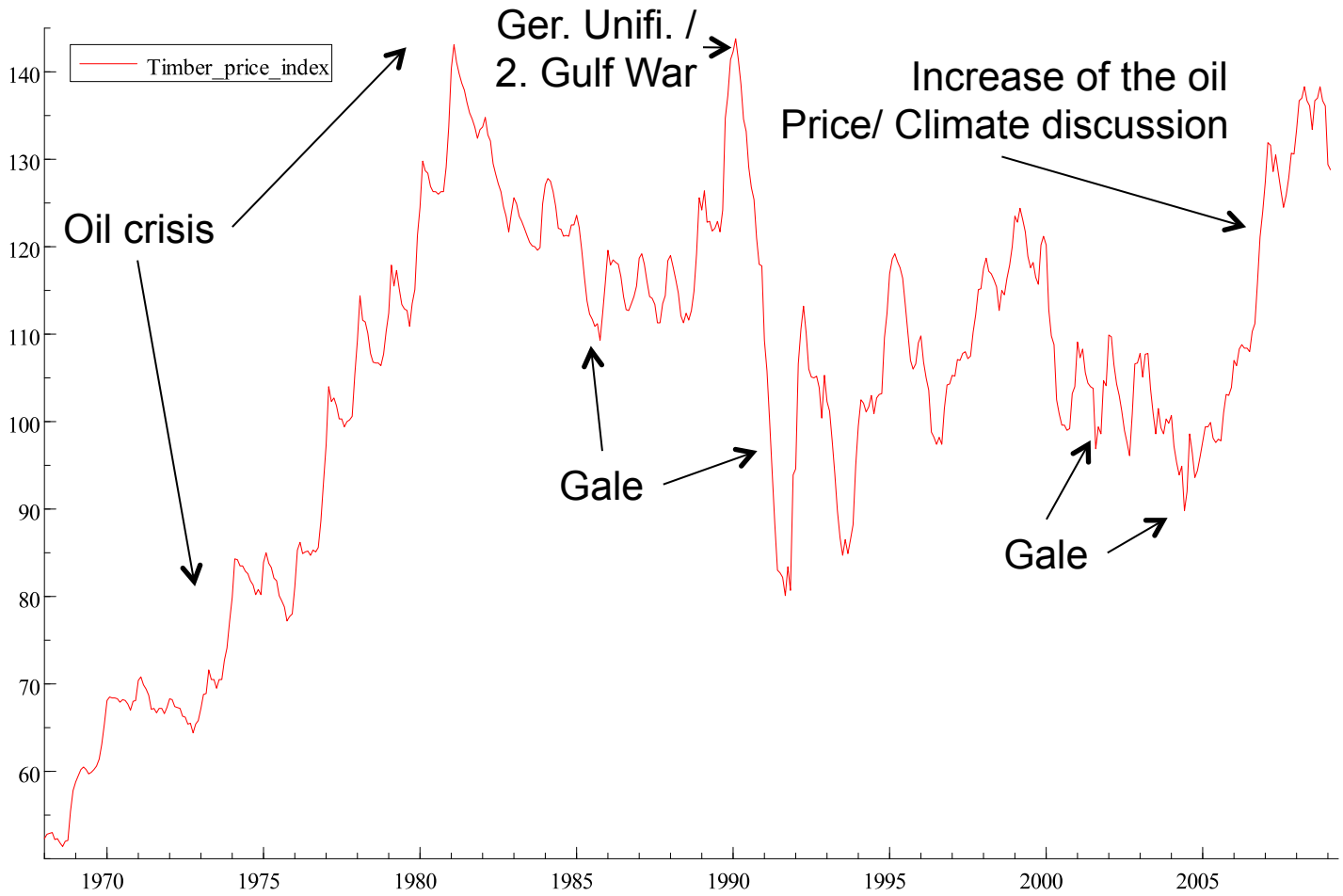
(2) Seasonal determinants and model

(3) Empirical analysis

(4) Conclusion and outlook

THE GERMAN ROUND WOOD PRICE

DEVELOPMENT OF THE GERMAN TIMBER PRICE INDEX

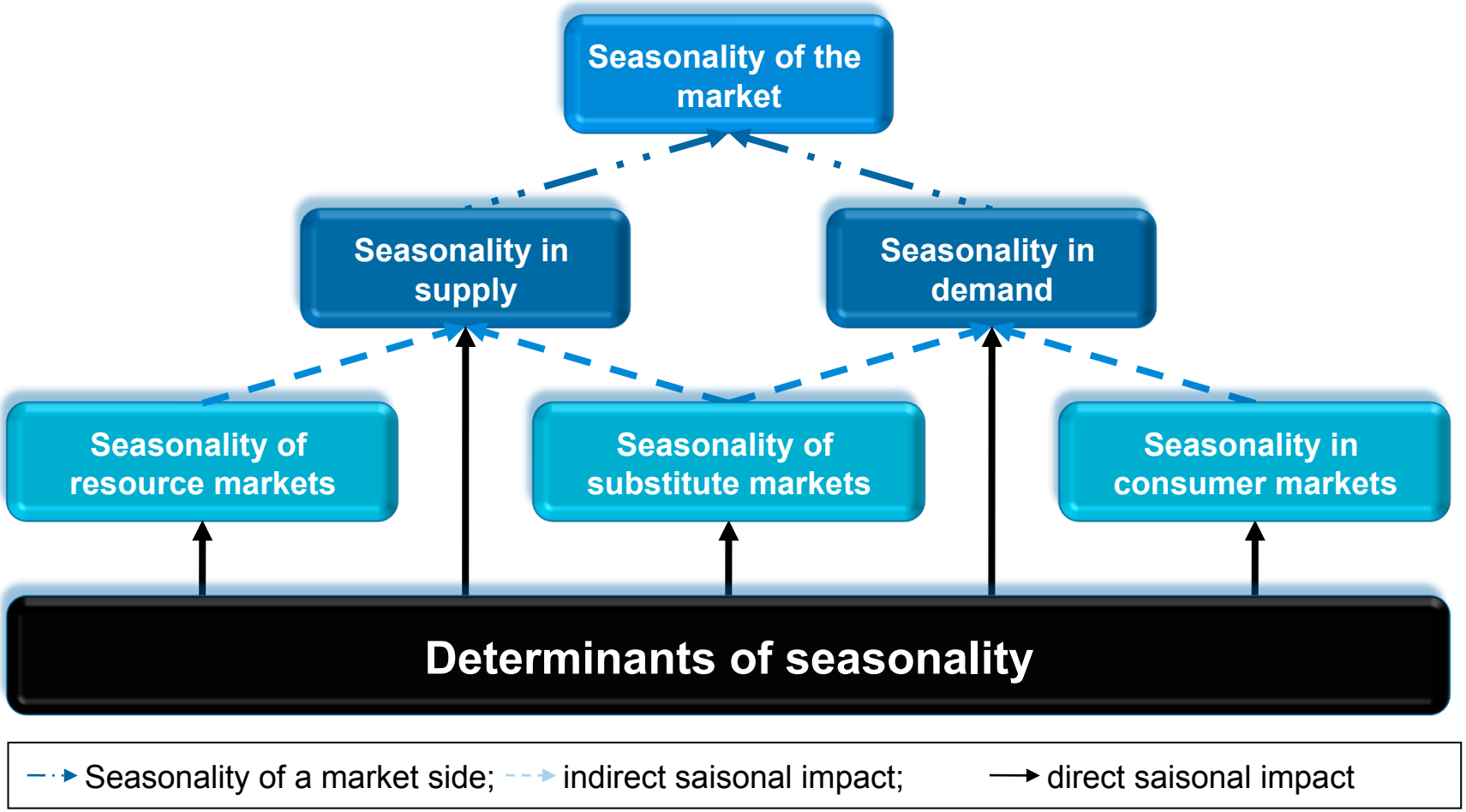


Reasons for a Seasonal Analysis

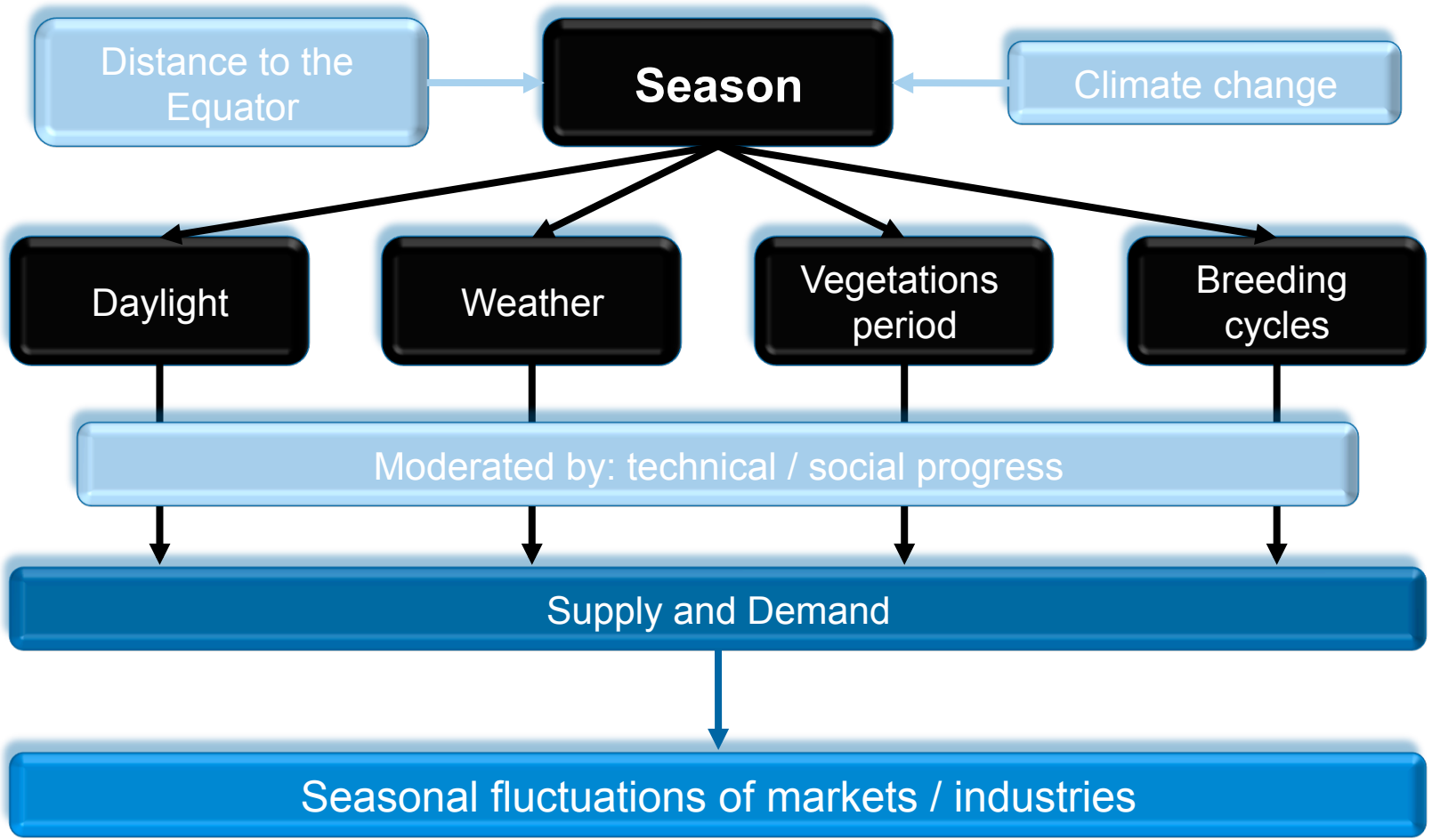
- Useful information for practitioners
- Reduction of seasonal fluctuations
- Insights of market interactions
- Differentiation between myth and facts

SEASONAL DETERMINANTS AND MODEL

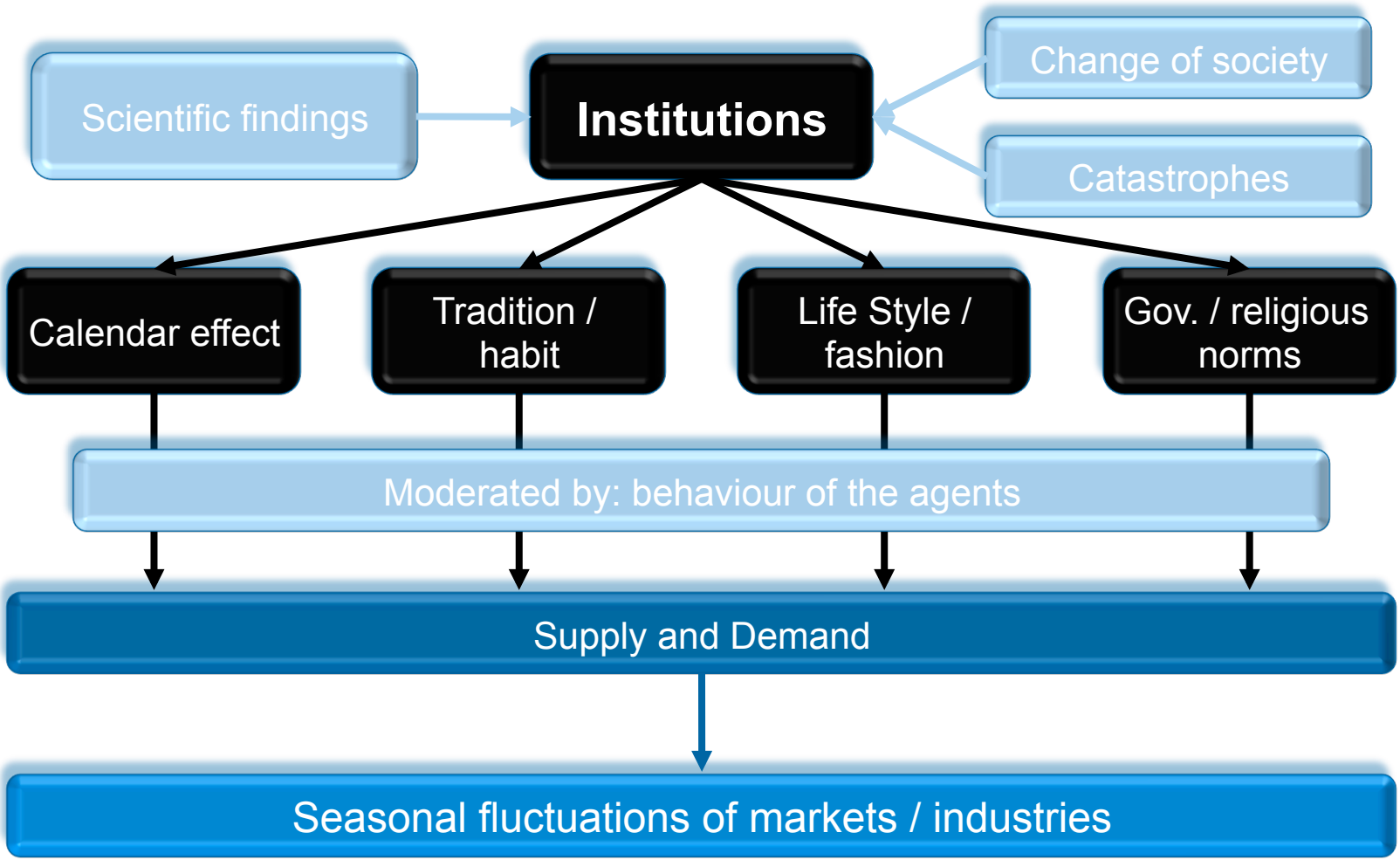
ORIGIN OF SEASONALITY



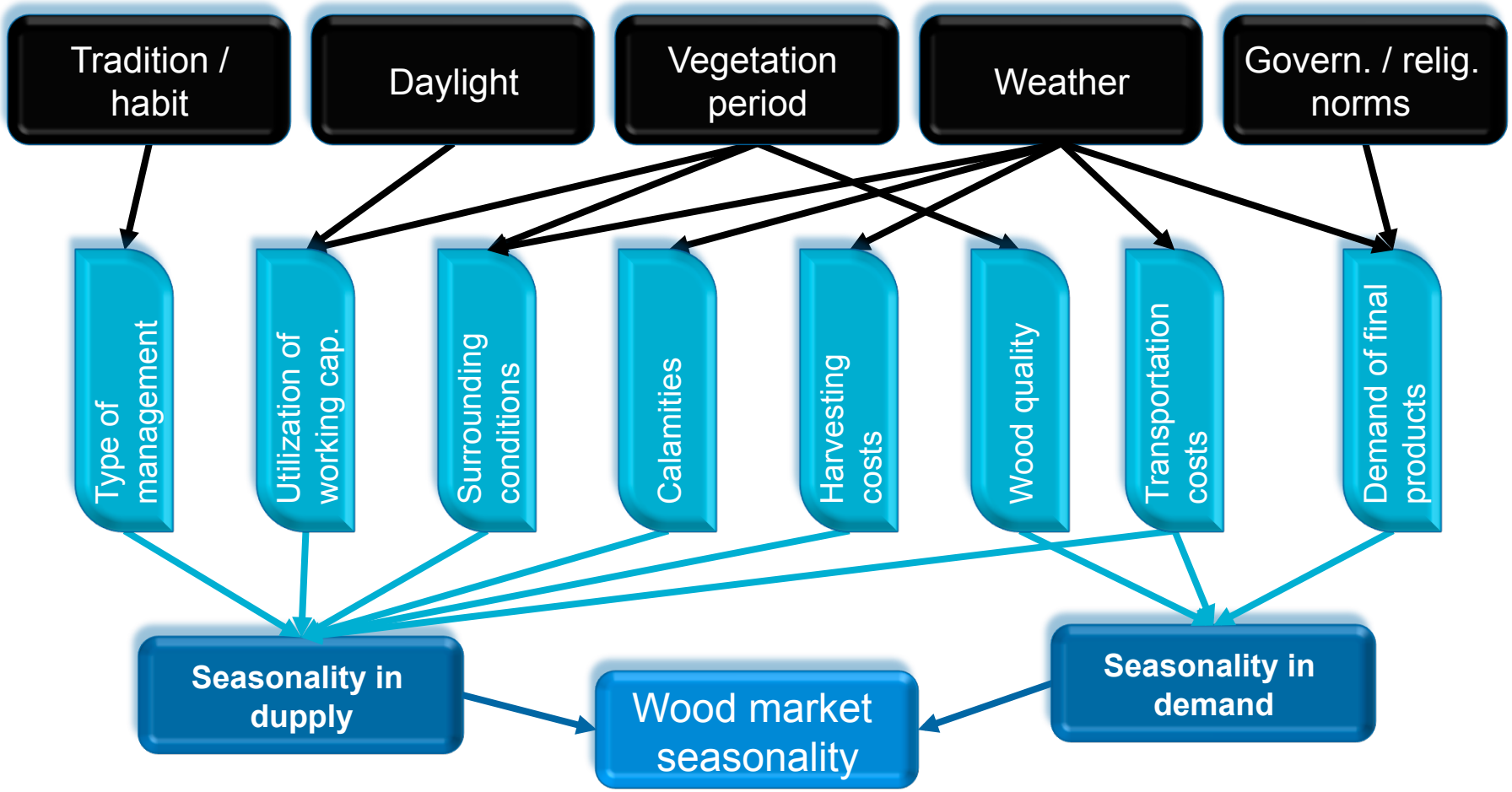
NATURAL SEASONALITY



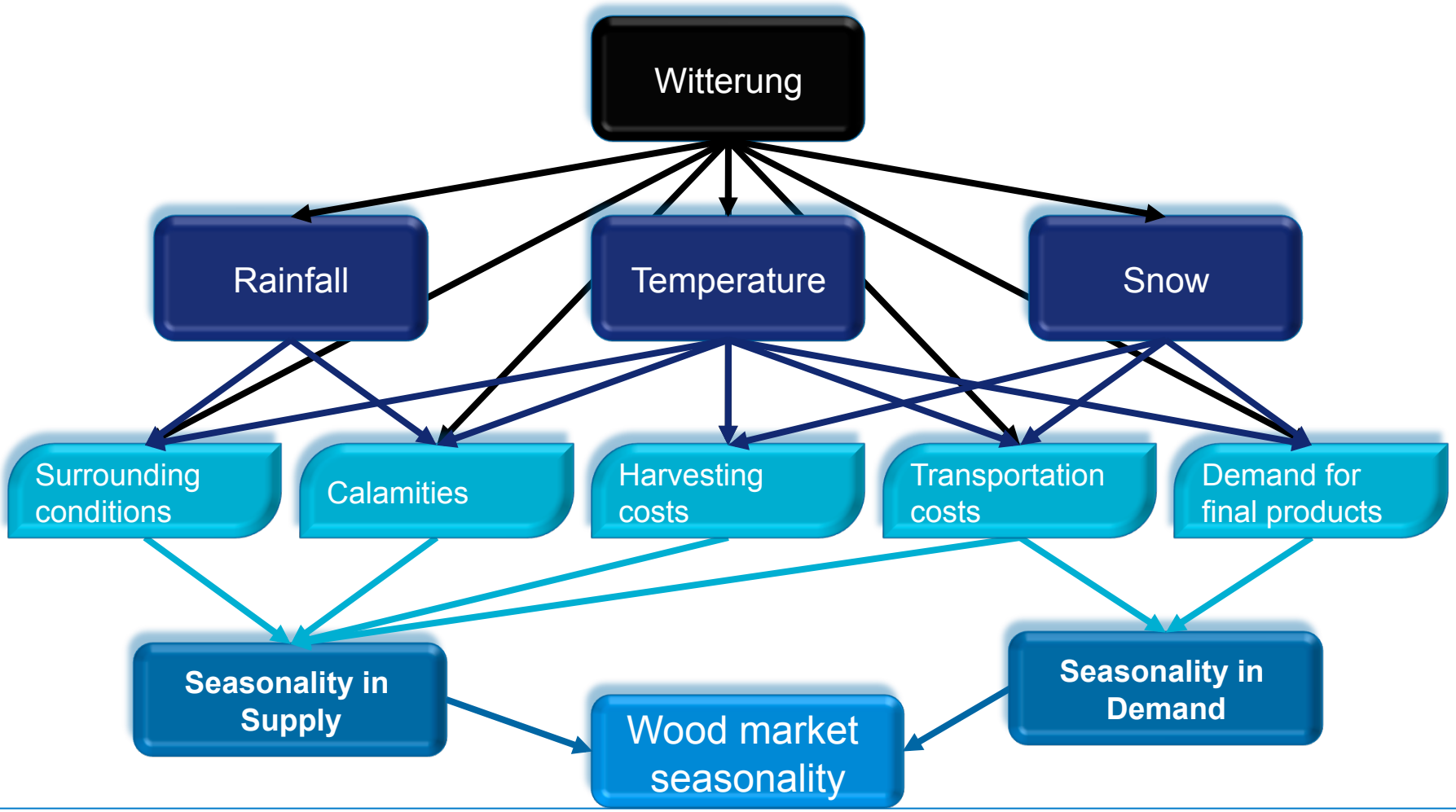
INSTITUTIONAL SEASONALITY



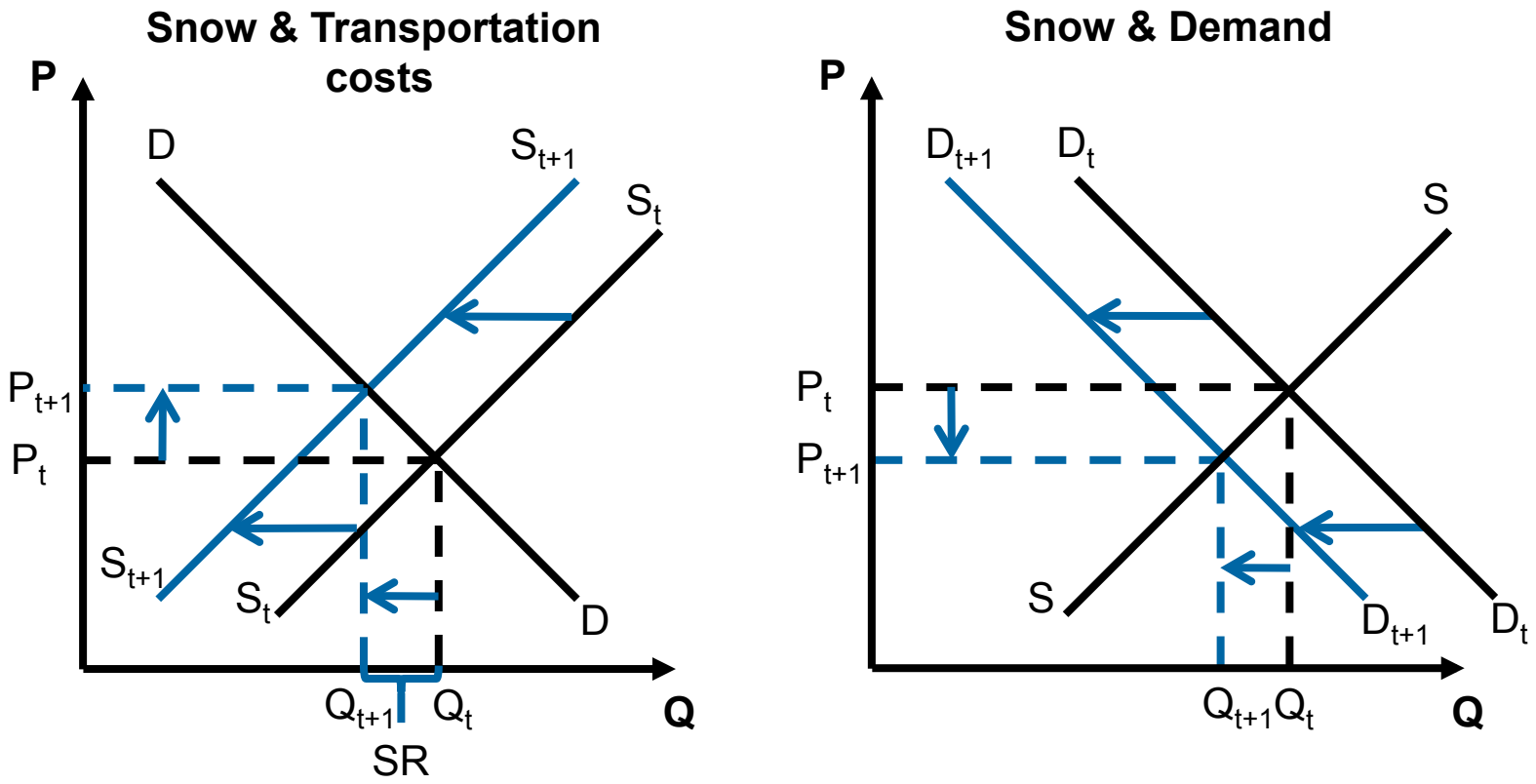
SEASONAL DETERMINANTS IN THE ROUND WOOD MARKET



SEASONAL IMPACT OF WEATHER

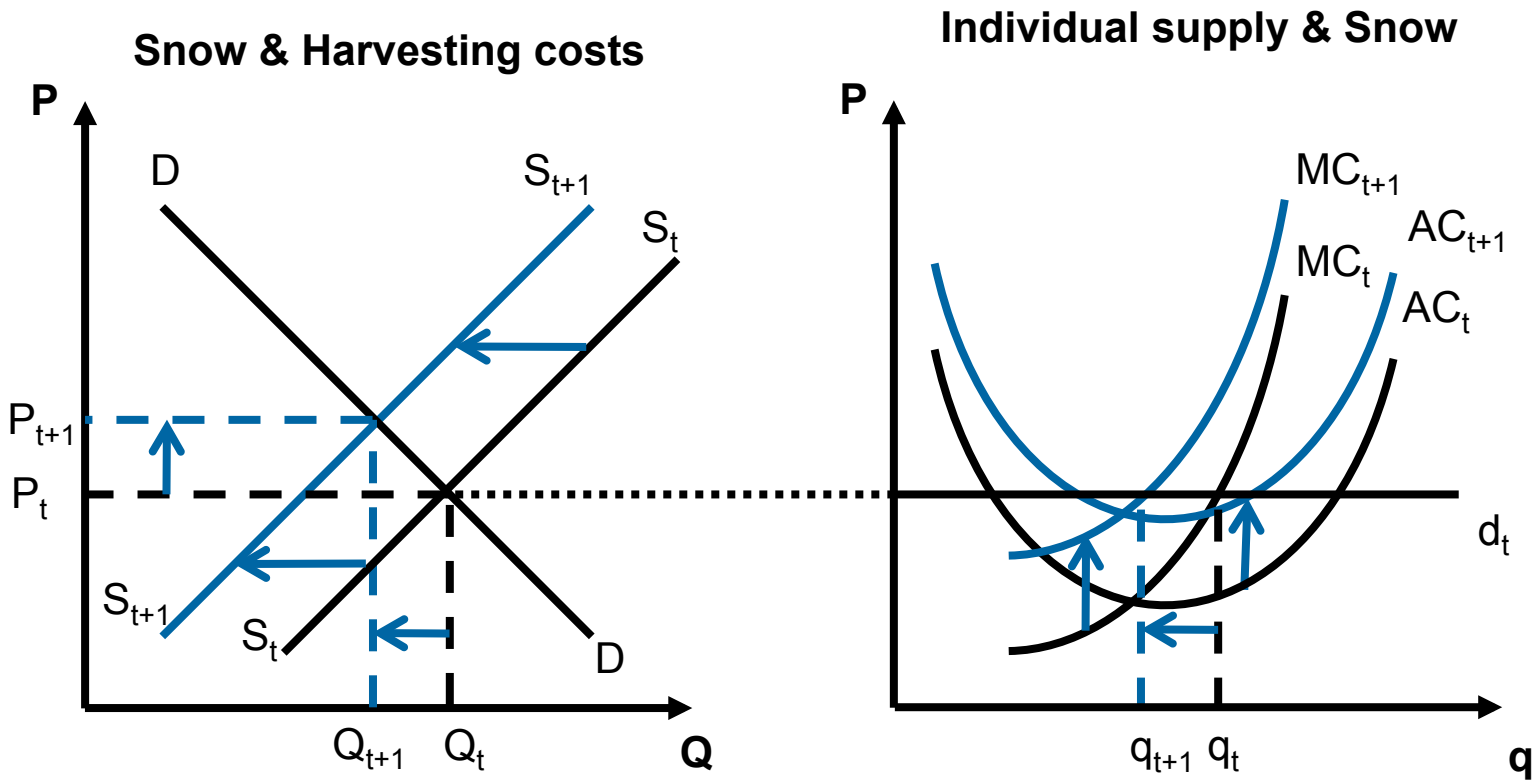


SNOW AS EXAMPLE OF SEASONAL IMPACT I



S = Supply; D = Demand; P = Price; t = time;
Q = Quantity; SR = snow induced reduction

SNOW AS EXAMPLE OF SEASONAL IMPACT II



S = Supply; P = Price; D = Demand; t = time; Q = Quantity; dual production;
MC = Marginal costs; AC = Average costs; d = demand for an individual company

Determinants Impact and Theory

Seasonal determinants	Hypo-theses	Parameter symbol	Market side	Impact on wood price
Daylight	H-B-1	L	Supply	reduction
Weather (Temperature)	H 2	Θ	Supply / Demand	undetermined
Weather (Rainfall)	H 3.1	Ψ	Supply	rise
Weather (Rainfall last year)	H 3.2	Ψ_{t-12}	Supply	reduction
Weather (snow)	H 4	T	Supply / Demand	rise
Vegetation period	H-B-5	V	Supply	undetermined
Govern. / religious norms (summer vacation)	H-B-6	O	Demand	reduction
Tradition / habit (Bauernbuckel)	H-B-7	B	Supply	reduction

THE MODEL SPECIFICATION

Definition of the seasonal component:

$$P_t^{RP} = f\left(T_t, C_t, S_t, I_t\right) \tag{1}$$

$$P_t^{RP} = T_t + C_t + S_t + I_t \rightarrow S_t^{RP} = P_t^{RP} - T_t - C_t - I_t \tag{2}$$

Model of German round wood seasonality:

$$S_t^{RP} = f\left(\Theta_t, \Psi_t, \overline{\Psi}_t^{M-J}, \mathrm{T}_t, L_t, V_t, B_t, G_t\right) \tag{3}$$

$$S_t^{RP} = \alpha + \beta^1\Theta_t + \beta^2\Psi_t + \beta^3\overline{\Psi}_t^{M-J} + \beta^3\mathrm{T}_t + \beta^4 L_t + \beta^5 V_t + \beta^6 B_t + \beta^7 G_t + \varepsilon \tag{4}$$

Assumptions: Additive model structure

EMPIRICAL ANALYSIS AND RESULTS

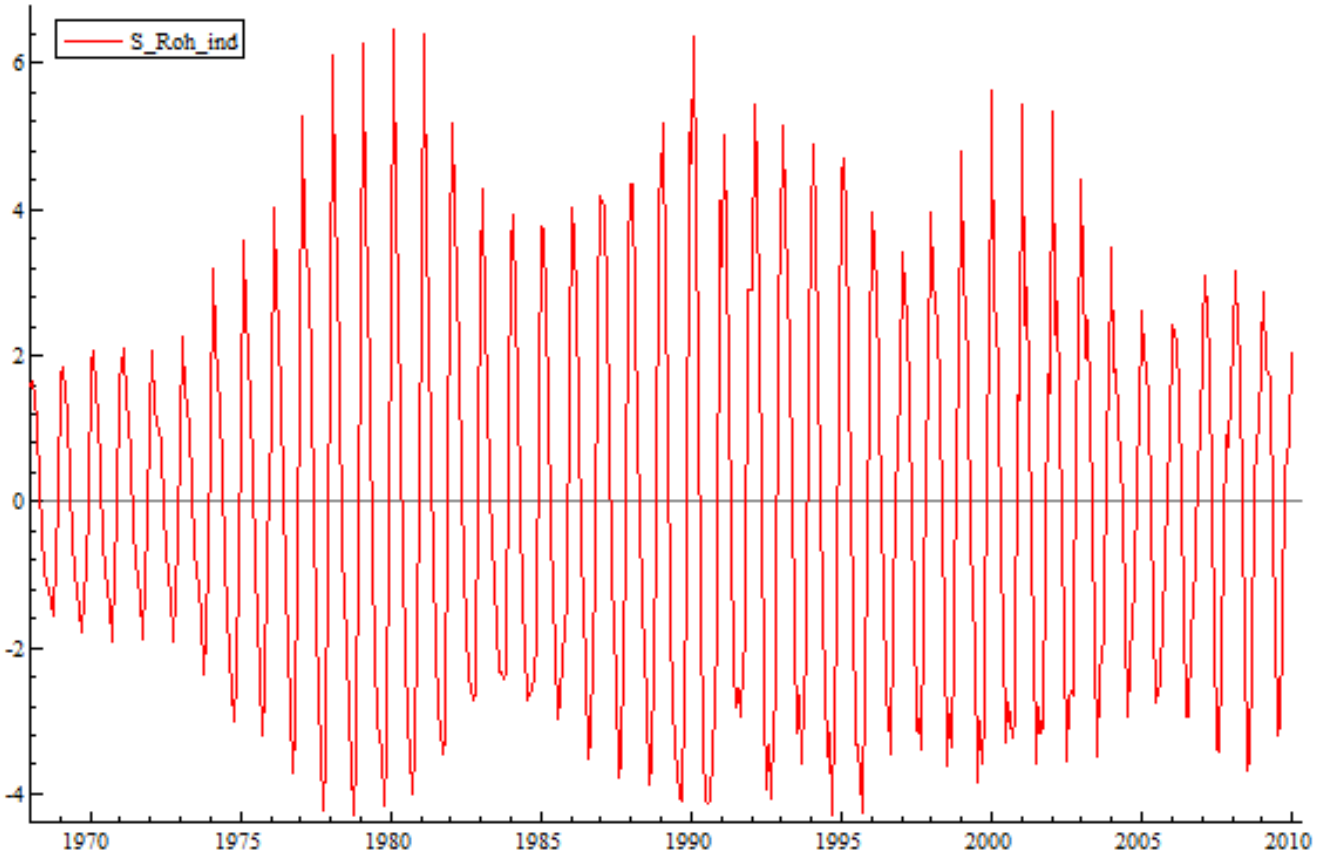
THA DATA

Data	Source	Availability	Treatment
German Round Wood Price Index	Statistisches Bundesamt	1968(1) – 2010(1)	X12-ARIMA
Temperature	PIK / DWD	1951(1) – 2010(4)	Aggregation
Rainfall	PIK / DWD	1951(1) – 2010(4)	Aggregation
Snow	DWD	1951(1) – 2010(1)	Aggregation
Vegetation period	Own calculation	1951(1) – 2010(4)	$V=f(\Theta)$
Summer vacation	Kultusministerkonferenz	1953 – 2010	Aggregation
Bauernbuckel	Own calculation	1951 – 2009	$B=f(V)$

USED MODEL AND METHOD

- Statistical program is Ox – Metrics
- Identification of seasonal component with X12-ARIMA
- OLS Regression (Single Equation Dynamic Modelling using PcGive)
- Used Data: 1969(1) – 20010(1) ; 1969(1) – 1988(12) ; 1991(1) – 20010(1)
- Forecast 36 month (not included in the model estimation)

THE SEASONAL COMPONENT (X-12ARIMA)



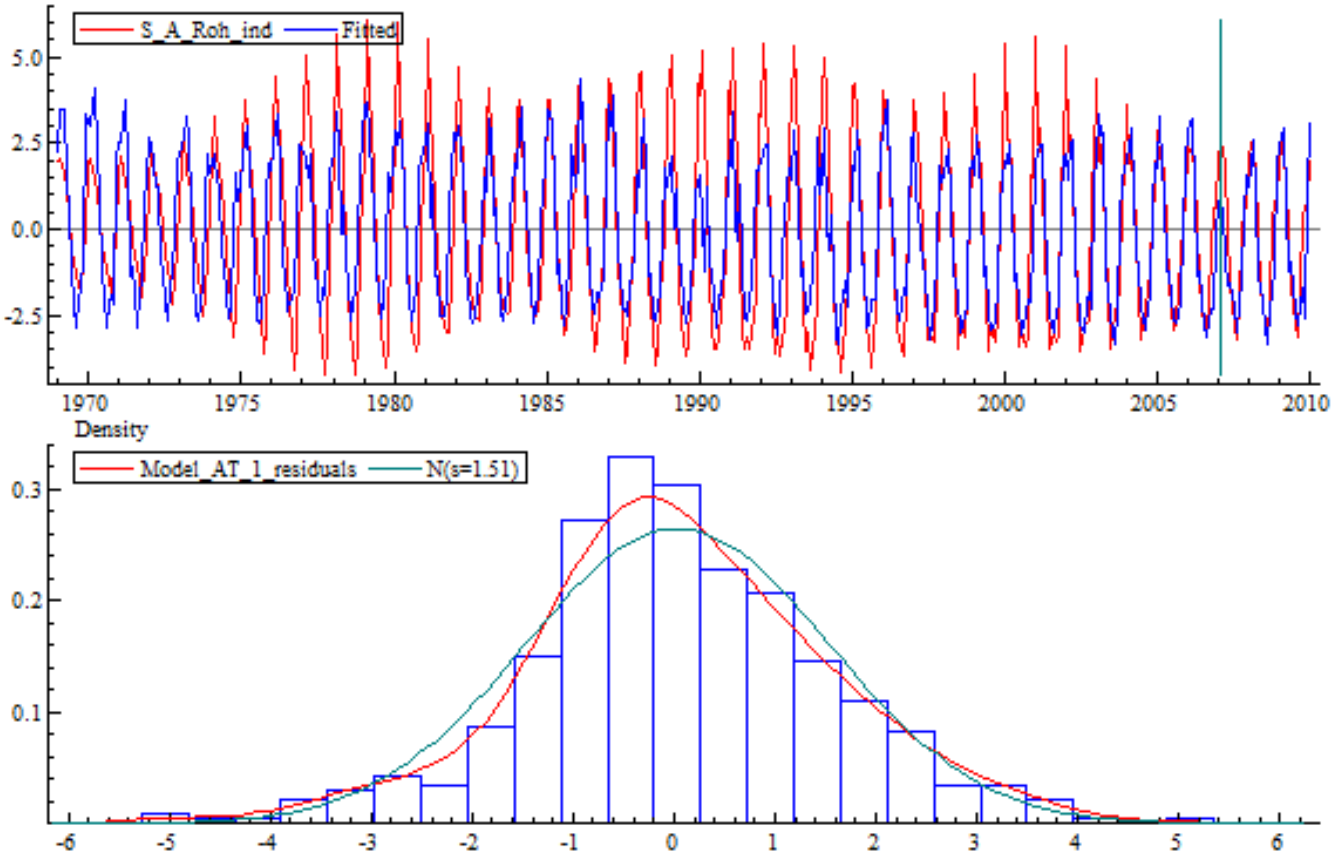
RESULTS MODEL 1969(1) – 2010(1)

Determinants	Coefficient	Std. Error	t-value	t-prob	Part. R²
α	-2,3287100	0,70180	-3,32	0,0010	0,0240
L	0,5382300	0,08007	6,72	0,0000	0,0916
Θ	-0,1681640	0,04589	-3,66	0,0003	0,0291
Ψ	-0,1832160	0,08693	-2,11	0,0356	0,0098
Ψ_{t-12}	-0,2136080	0,12070	-1,77	0,0774	0,0069
T	0,0419431	0,03040	1,38	0,1683	0,0042
V	-3,5434000	0,39150	-9,05	0,0000	0,1546
O	-0,0446646	0,01517	-2,94	0,0034	0,0190
B	1,6985500	0,30220	5,62	0,0000	0,0659

R^2 = 0.643513; ε = 1,54367 & i.i.d.

$$S_t^{RP} = -2{,}33 - 0{,}17\Theta_t - 0{,}18\Psi_t + 0{,}54L_t - 3{,}54V_t + 1{,}7B_t - 0{,}04G_t + 1{,}54$$

GRAPHICAL RESULTS MODEL 1969(1) – 2010(1)



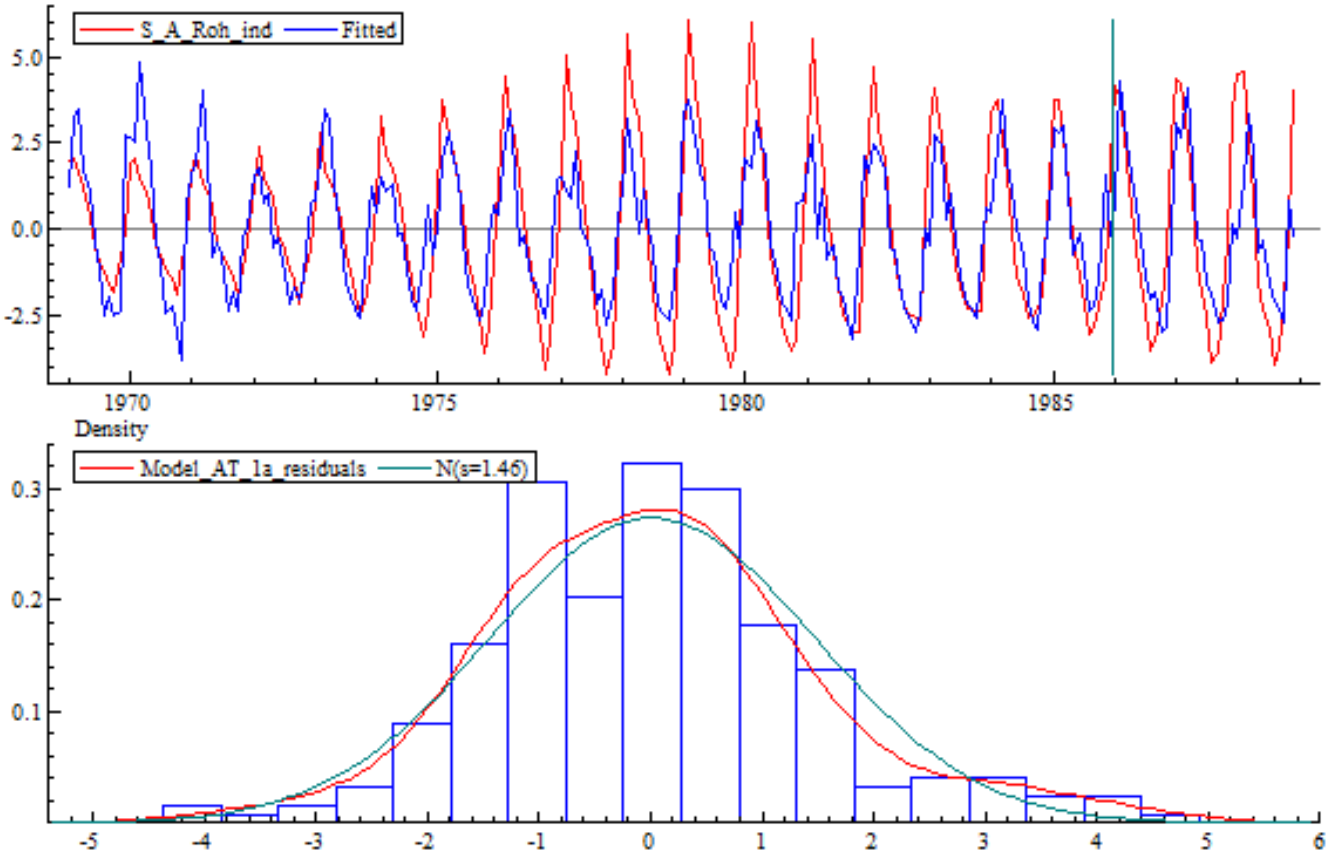
RESULTS MODEL 1969(1) – 1988(12)

Determinants	Coefficient	Std. Error	t-value	t-prob	Part. R^2
α	-6,9679900	0,93410	-7,460	0,0000	0,2220
L	0,9476480	0,10660	8,890	0,0000	0,2885
Θ	-0,1797810	0,07011	-2,560	0,0111	0,0326
Ψ	-0,3136180	0,11800	-2,660	0,0085	0,0350
Ψ_{t-12}	-0,1469420	0,16750	-0,8770	0,3815	0,0039
T	0,0958244	0,03814	2,510	0,0128	0,0314
V	-4,0534100	0,56810	-7,140	0,0000	0,2070
O	-0,0446278	0,02232	-2,000	0,0470	0,0201
B	1,7622900	0,41770	4,220	0,0000	0,0837

R^2 = 0.657569; ε = 1,39974 & i.i.d.

$$S_t^{RP} = -6{,}97 - 0{,}18\Theta_t - 0{,}31\Psi_t + 0{,}95L_t + 0{,}1\mathrm{T}_t - 4{,}05V_t + 1{,}76B_t - 0{,}04G_t + 1{,}4$$

GRAPHICAL RESULTS MODEL 1969(1) – 1988(12)



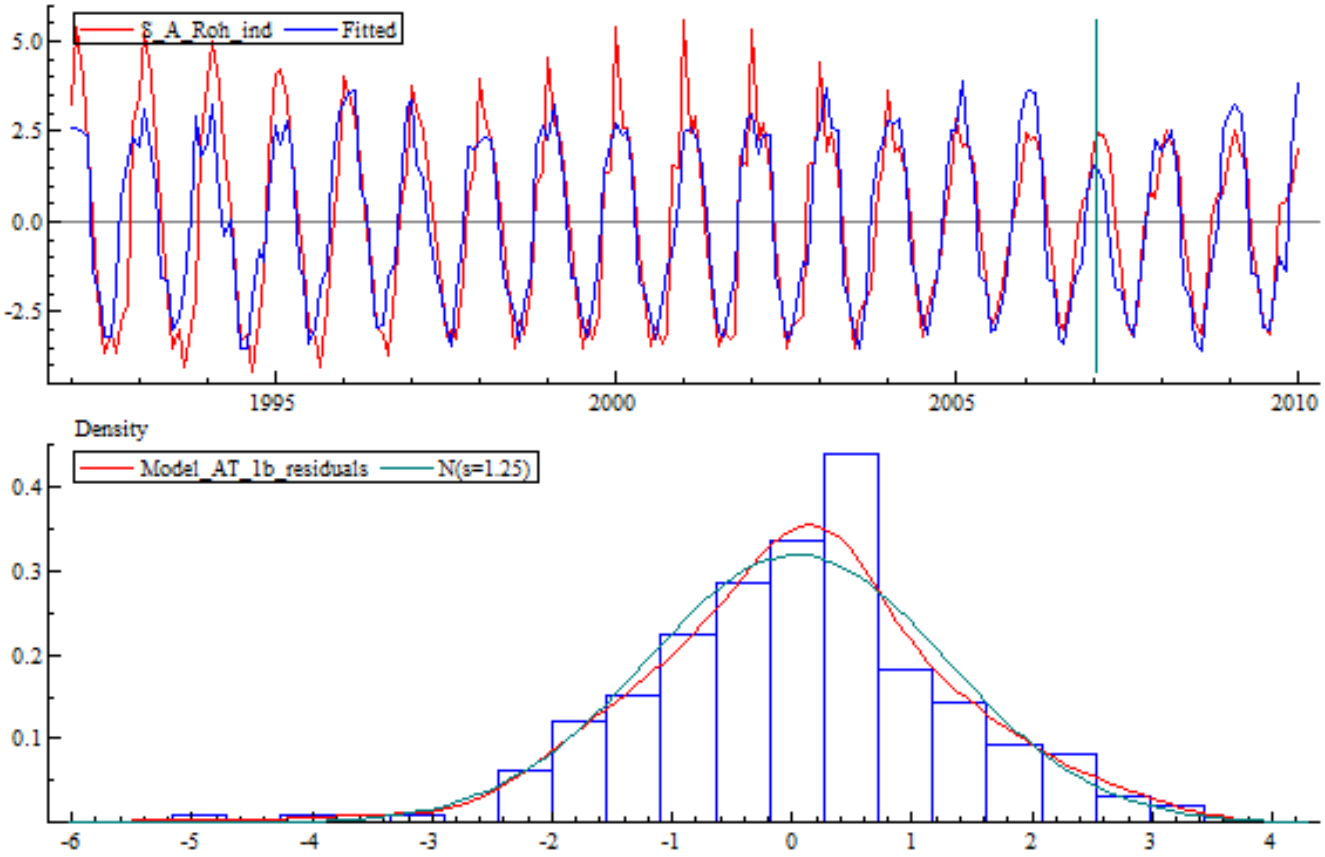
RESULTS MODEL 1992(1) – 2010(1)

Determinants	Coefficient	Std. Error	t-value	t-prob	Part. R²
α	0,6686450	0,99510	0,672	0,5025	0,0026
L	0,2361090	0,11350	2,08	0,0390	0,0245
Θ	-0,1423700	0,05972	-2,38	0,0182	0,0320
Ψ	-0,1537090	0,11860	-1,30	0,1969	0,0097
Ψ_{t-12}	-0,2278140	0,17060	-1,34	0,1836	0,0103
T	0,0712222	0,05146	1,38	0,1681	0,0110
V	-2,7650300	0,50420	-5,48	0,0000	0,1488
O	-0,0494809	0,01917	-2,58	0,0107	0,0373
B	1,6239100	0,42330	3,84	0,0002	0,0788

$R^2 = 0.754724$; $\varepsilon = 1.32449$& i.i.d.

$$S_t^{RP} = 0{,}67 - 0{,}14\Theta_t + 0{,}24L_t - 2{,}77V_t + 1{,}62B_t - 0{,}05G_t + 1{,}32$$

GRAPHICAL RESULTS MODEL 1992(1) – 2010(1)



Overview Results

Seasonal determinants	Parameter symbol	Model 1 (at 95% level)	Model 1a (at 95% level)	Model 1b (at 95% level)
Daylight	L	0,5382300	0,9476480	0,2361090
Weather (Temperature)	Θ	-0,1681640	-0,1797810	-0,1423700
Weather (Rainfall)	Ψ	-0,1832160	-0,3136180	Not signif.
Weather (Rainfall last year)	Ψ_{t-12}	Not signif.	Not signif.	Not signif.
Weather (snow)	T	Not signif.	0,0958244	Not signif.
Vegetation period	V	-3,5434000	-4,0534100	-2,7650300
Govern. / religious norms (summer vacation)	O	-0,0446646	-0,0446278	-0,0494809
Tradition / habit (Bauernbuckel)	B	1,6985500	1,7622900	1,6239100

CONCLUSION AND OUTLOOK

Draw Back to Hypotheses I

- Daylight is significant but wrong sign
- Low temperatures increase price and v.v.
- Weather effects relevant until 1988
- Weather calamity effect is not relevant
- Snow is relevant only until 1988

DRAW BACK TO HYPOTHESES II

- *"Bauernbuckel"* is significant but wrong sign
- Vacation are; as expected
- Vegetation period seems to be most important
- Cost effects are dominating the vegetation effects
- 1990 seems to be a brake

OUTLOOK

- *Interpreting the results*
- *Further analysis with data of submarkets*

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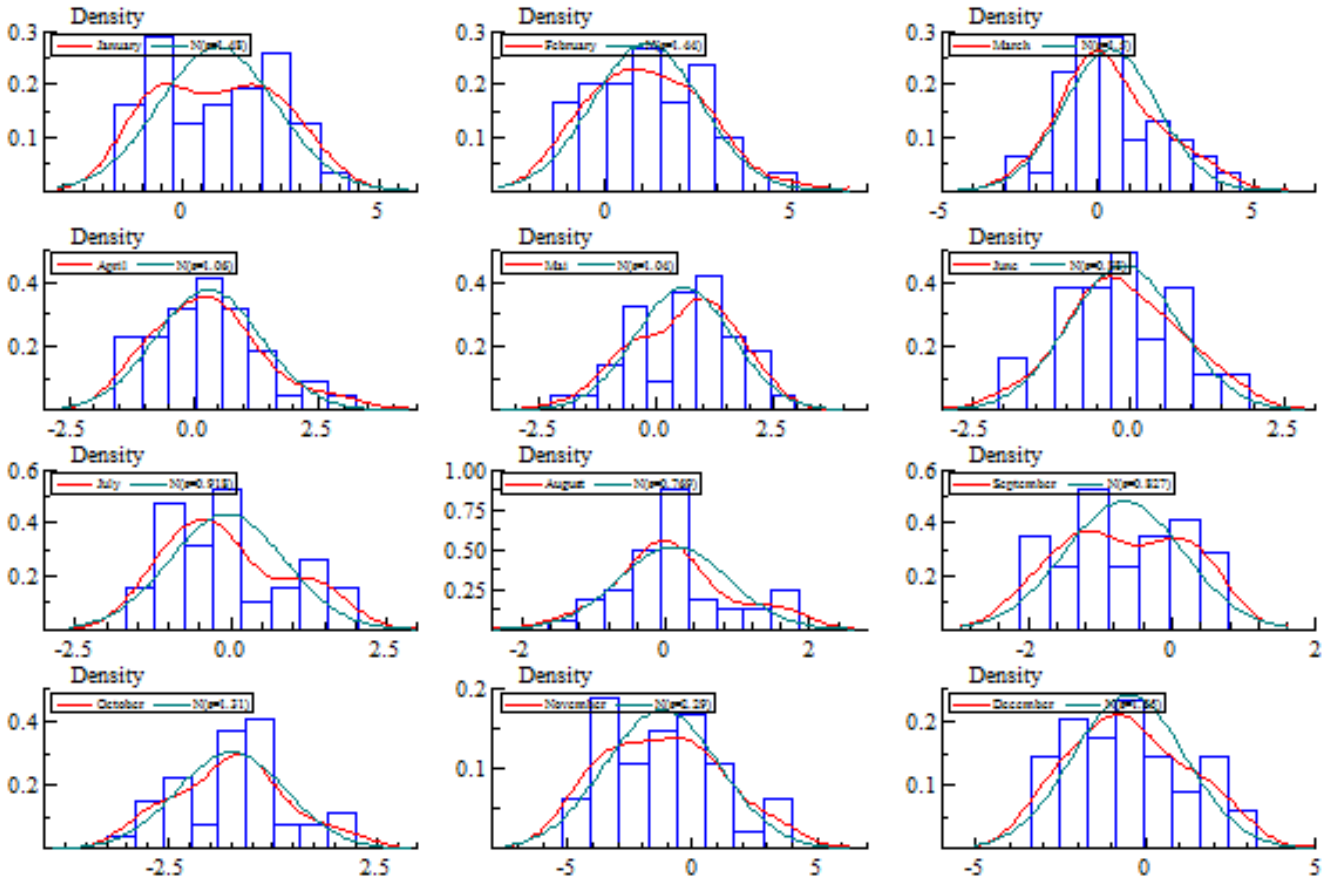
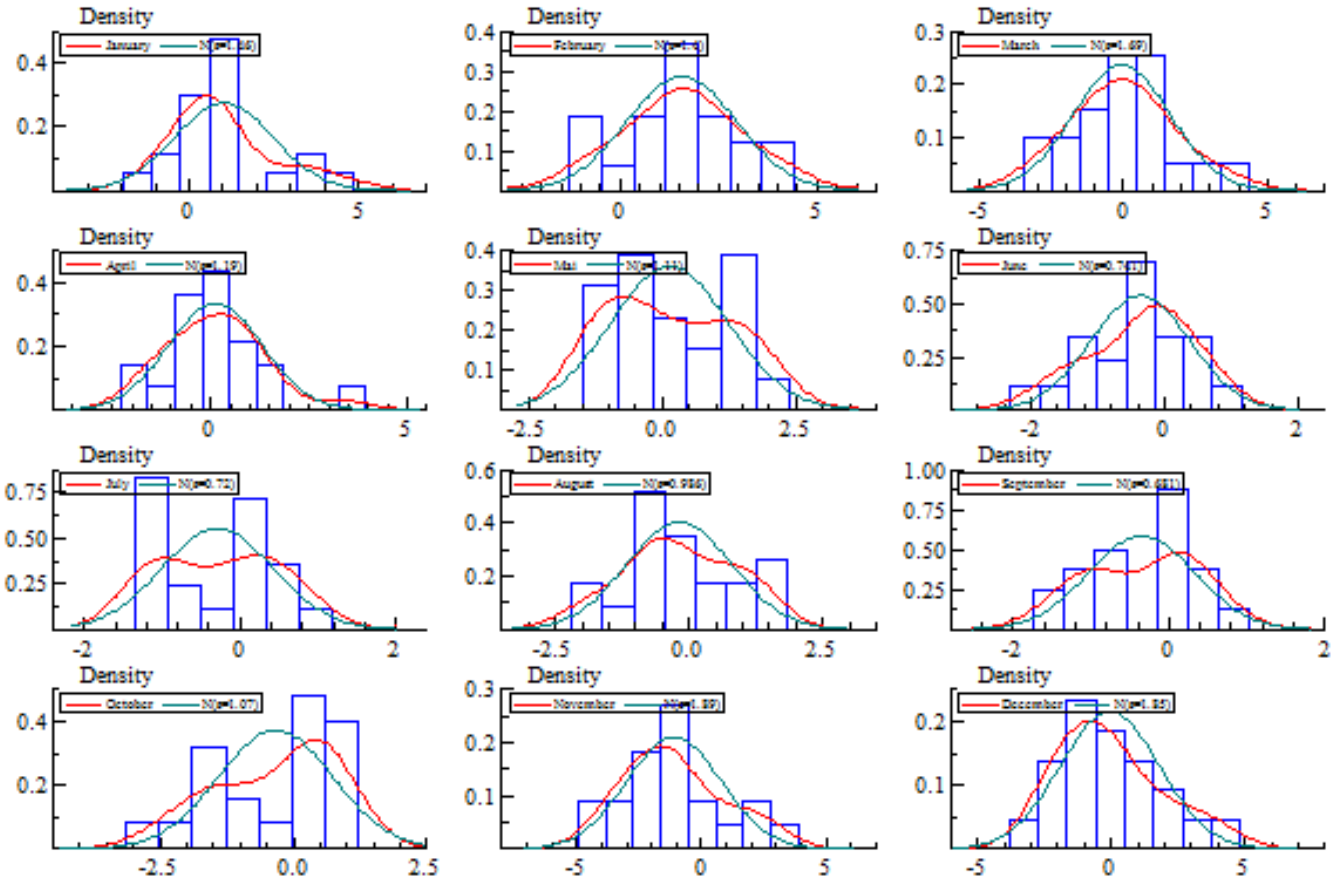
GRAPHICAL RESULTS MODEL 1969(1) – 2010(1)



GRAPHICAL RESULTS MODEL 1969(1) – 1988(12)



GRAPHICAL RESULTS MODEL 1992(1) – 2010(1)