

Supplement to

Bayesian Regularization in Regression Models for Survival Data

Susanne Konrath

This supplement provides extended results to various sections of the dissertation “Bayesian Regularization in Regression Models for Survival Data” (Susanne Konrath, Department of statistics, LMU Munich, 16.04.2013). Mainly figures and tables omitted due to the limited space of the dissertation are presented here. To ease orientation the sections in the supplement have the numbers used in the dissertation equipped with the prefix “S” for identifiability purposes.

S.10. Simulations: AFT-Type Models

Considered is the AFT model with baseline error distribution densities BED 1 to BED 4

- BED 1: $y_0 \sim \text{Gumbel}(\mu = 3, \sigma = 1.5)$
- BED 2: $y_0 \sim 0.75 \cdot N(\mu = -3, \sigma^2 = 1) + 0.25 \cdot N(\mu = 2, \sigma^2 = 1)$
- BED 3: $y_0 \sim 0.4 \cdot N(\mu = -3, \sigma^2 = 1) + 0.6 \cdot N(\mu = 0, \sigma^2 = 3.5)$
- BED 4: $y_0 \sim 0.5 \cdot N(\mu = 0, \sigma^2 = 1) + 0.5 \cdot N(\mu = 0, \sigma^2 = 3.5)$

as introduced in the Simulation section 10 under the different, selected single and block update methods for the error weights described in Section 6.1.3. The mean and variance of this distributions is given by

- BED1: $E(Y_0) \approx -2.124$ and $\text{Var}(Y_0) \approx 3.701$,
- BED2: $E(Y_0) = -1.75$ and $\text{Var}(Y_0) = 5.6875$,
- BED3: $E(Y_0) = -1.2$ and $\text{Var}(Y_0) = 9.91$,
- BED4: $E(Y_0) = 0$ and $\text{Var}(Y_0) = 6.625$.

S.10.1. Density estimation

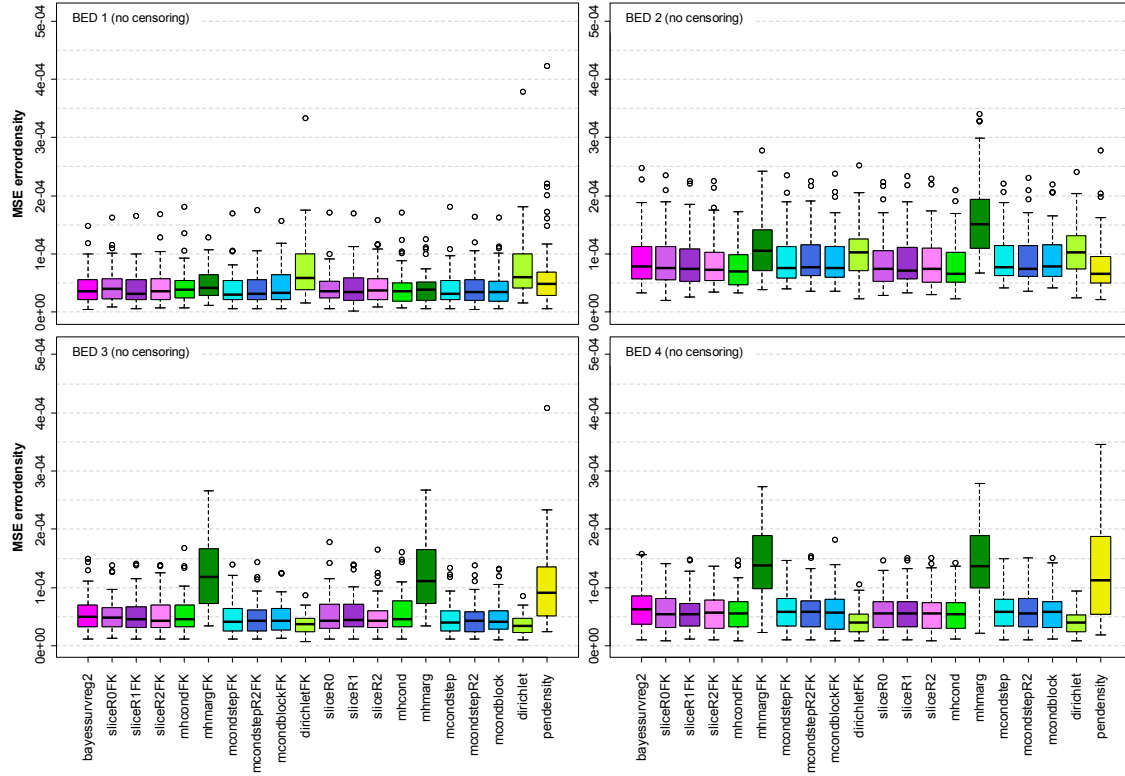


Figure S.10.1: Mean squared errors of the estimated baseline error density, $MSE(\hat{f}_{v_0})$, in the AFT model with baseline error densities BED 1 (upper left panel) to BED 4 (lower right panel) without censoring in the simulation data.

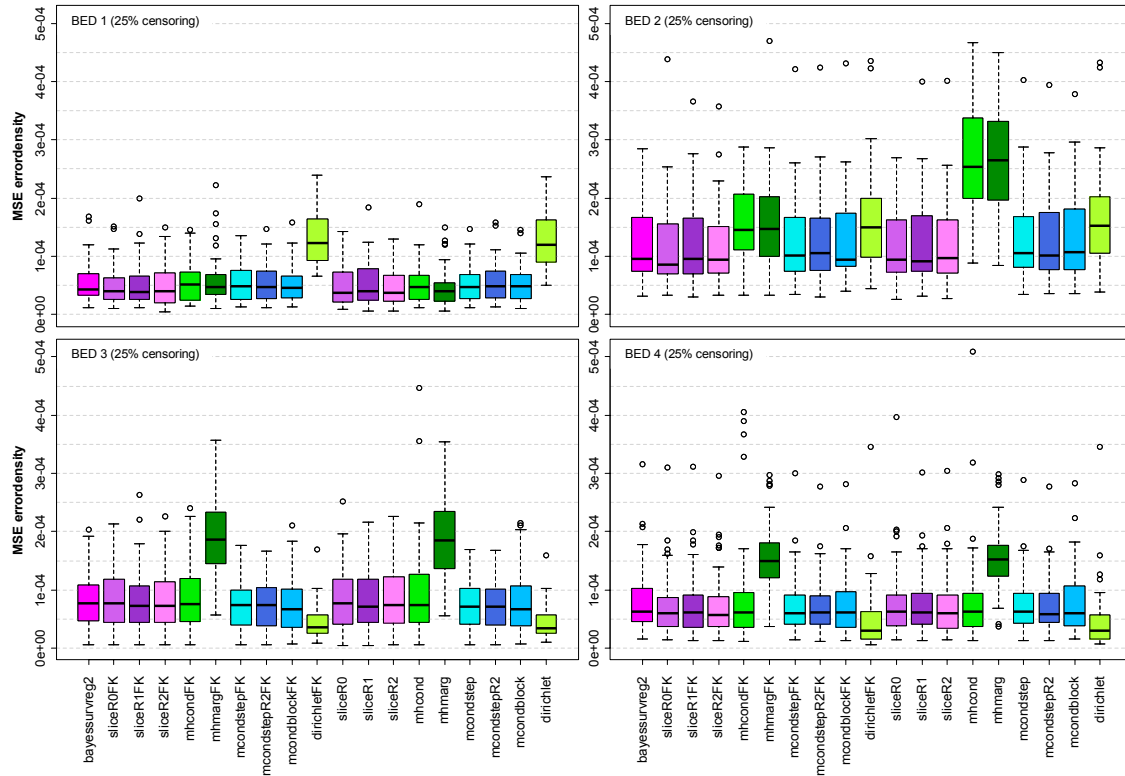


Figure S.10.2: Mean squared errors of the estimated baseline error density, $MSE(\hat{f}_{v_0})$, in the AFT model with baseline error densities BED 1 (upper left panel) to BED 4 (lower right panel) under 25% censoring in the simulation data.

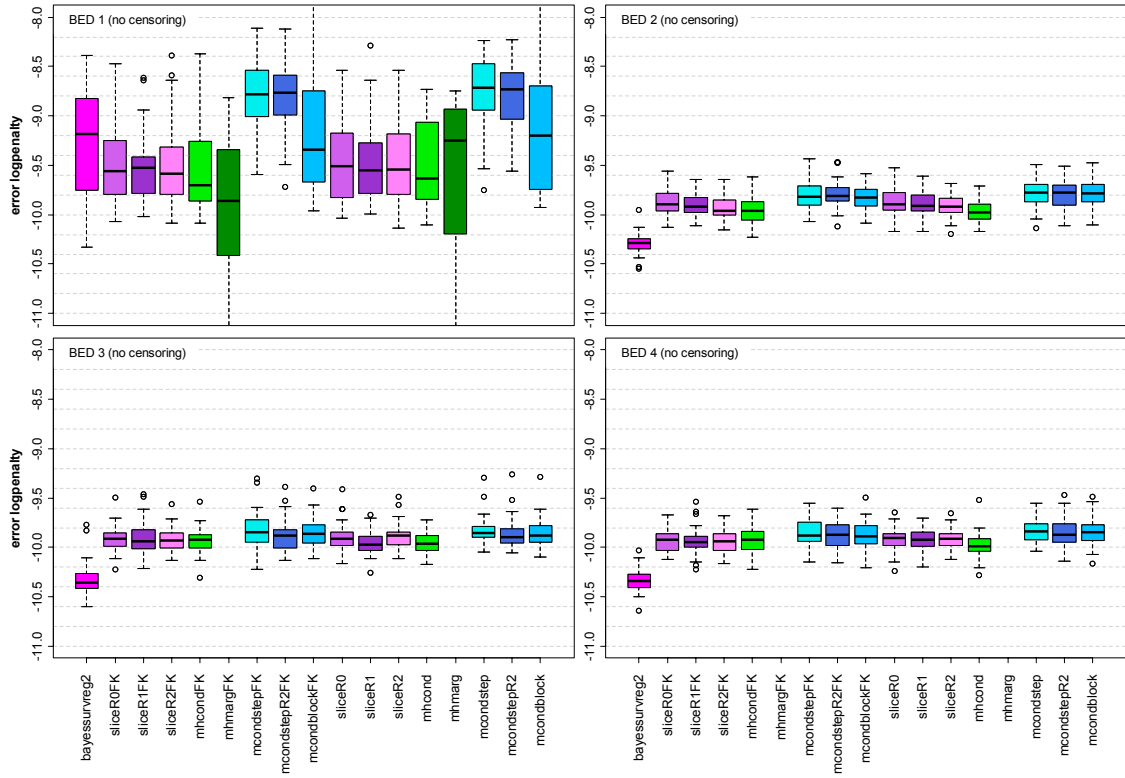


Figure S.10.3: Logarithm of the estimated error density penalty term, $-\tau_{\alpha_0}^{-2} \alpha_0' \mathbf{K}_0 \alpha_0$, in the AFT model with baseline error distribution BED 1 (upper left panel) to BED 4 (lower right panel) without censoring in the simulation data.

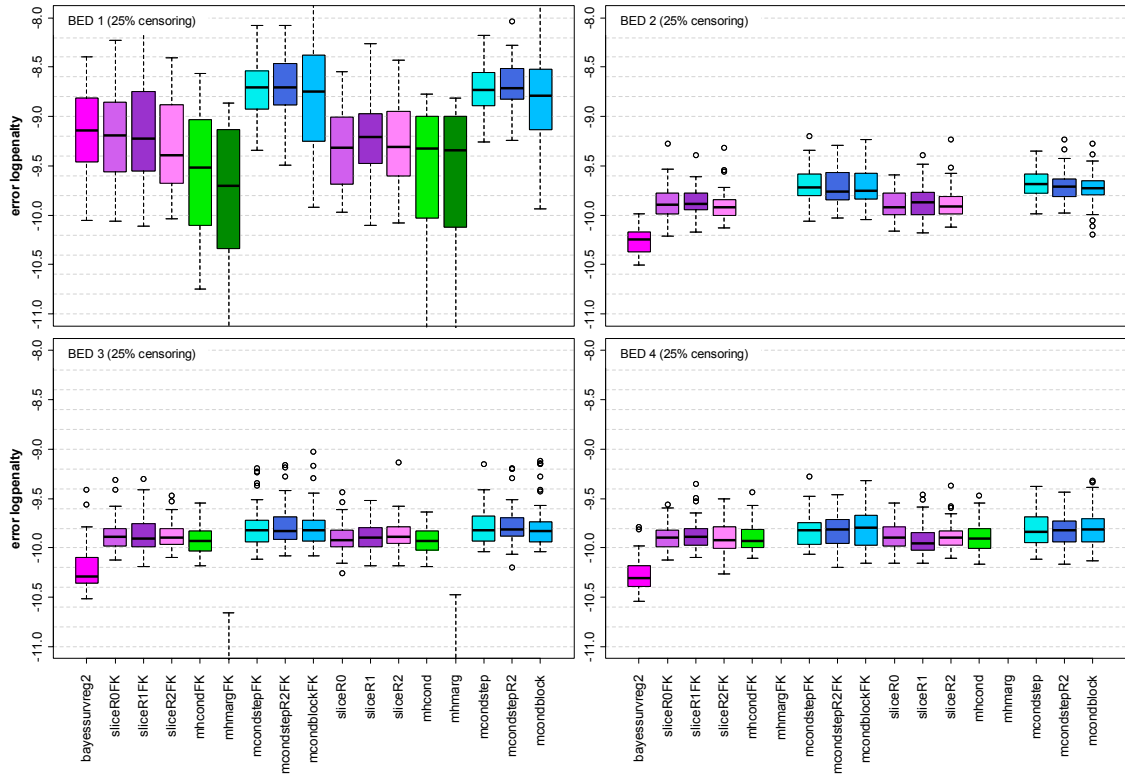


Figure S.10.4: Logarithm of the estimated error density penalty term, $-\tau_{\alpha_0}^{-2} \alpha_0' \mathbf{K}_0 \alpha_0$, in the AFT model with baseline error distribution BED 1 (upper left panel) to BED 4 (lower right panel) with 25% censoring in the simulation data.

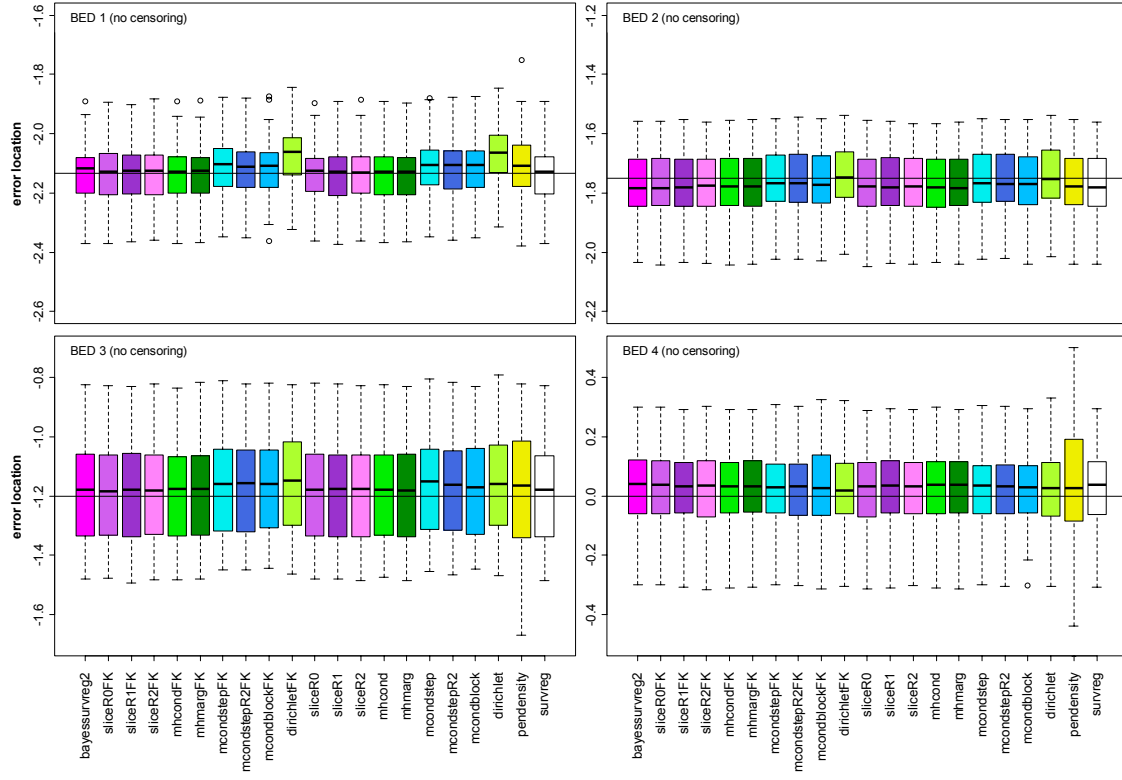


Figure S.10.5: Estimated location parameter in the AFT model with baseline error distribution BED 1 (upper left panel) to BED 4 (lower right panel) without censoring in the simulation data. The horizontal lines mark the true location μ_{Y_0} of the associated baseline error distribution.

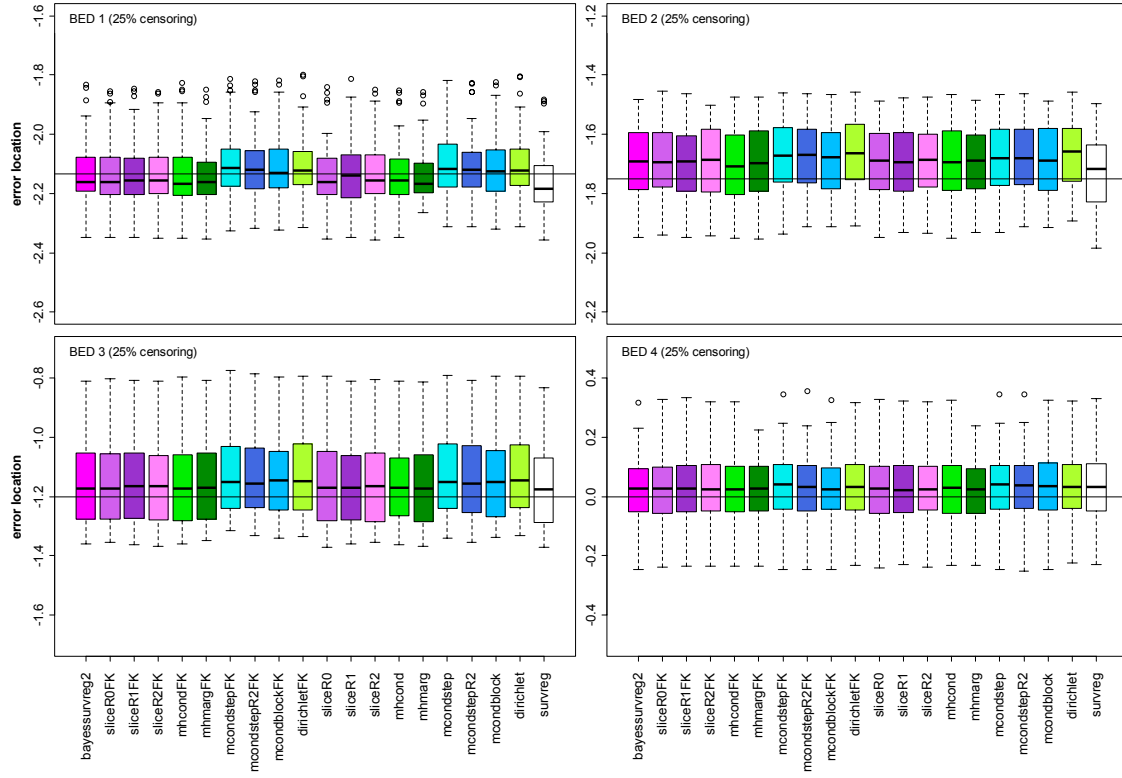


Figure S.10.6: Estimated location parameter in the AFT model with baseline error distribution BED 1 (upper left panel) to BED 4 (lower right panel) with 25% censoring in the simulation data. The horizontal lines mark the true location μ_{Y_0} of the associated baseline error distribution.

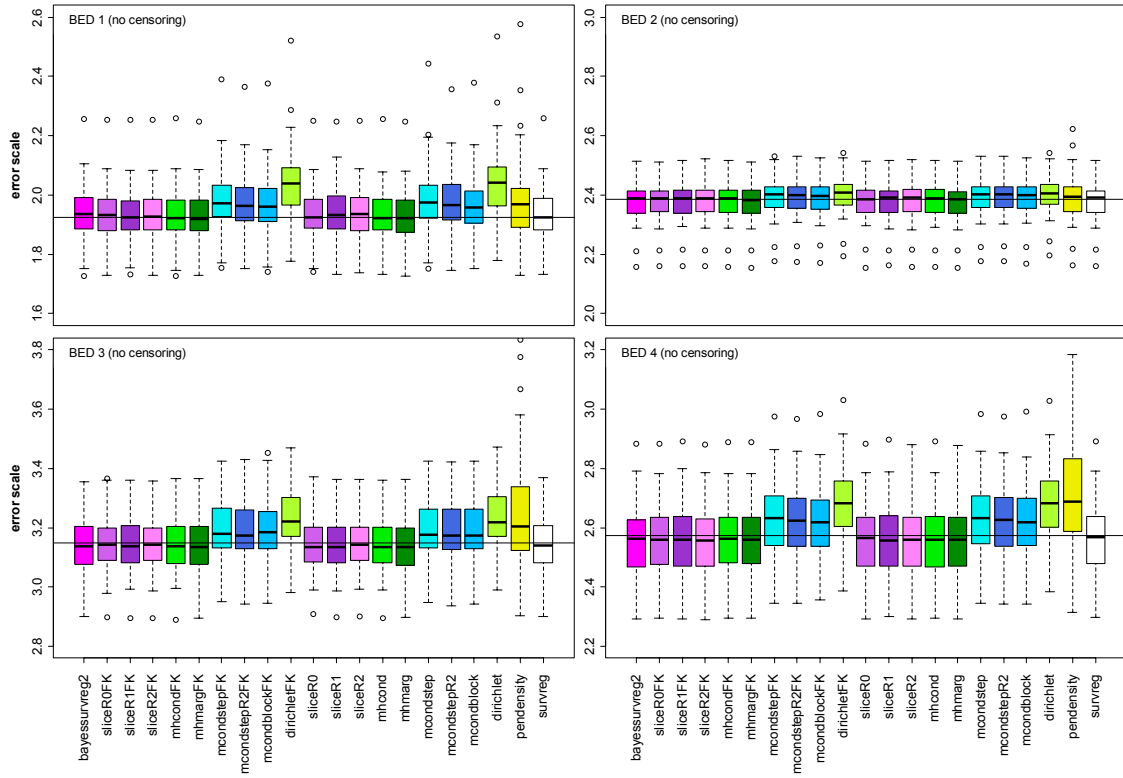


Figure S.10.7: Estimated scale parameter in the AFT model with baseline error distribution BED 1 (upper left panel) to BED 4 (lower right panel) without censoring in the simulation data. The horizontal lines mark the true squared scale $\sigma_{v_0}^2$ of the associated baseline error distribution.

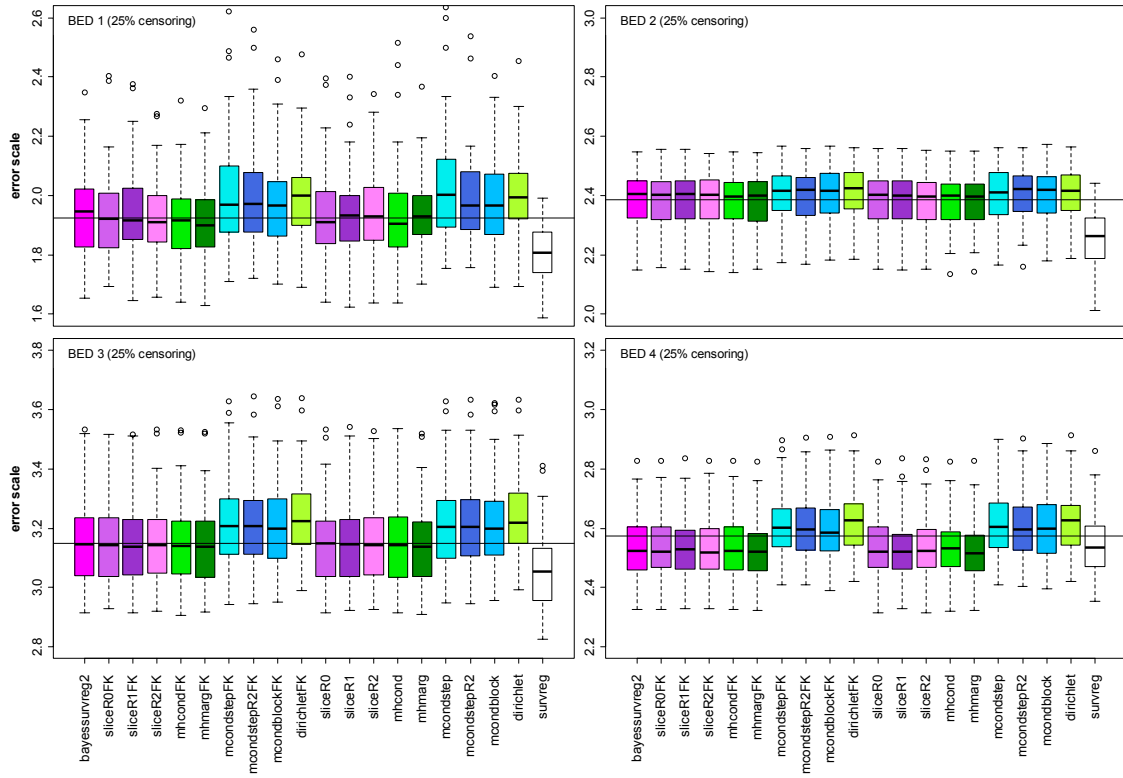


Figure S.10.8: Estimated scale parameter in the AFT model with baseline error distribution BED 1 (upper left panel) to BED 4 (lower right panel) with 25% censoring in the simulation data. The horizontal lines mark the true squared scale $\sigma_{v_0}^2$ of the associated baseline error distribution.

S.10.2. Low-dimensional predictor

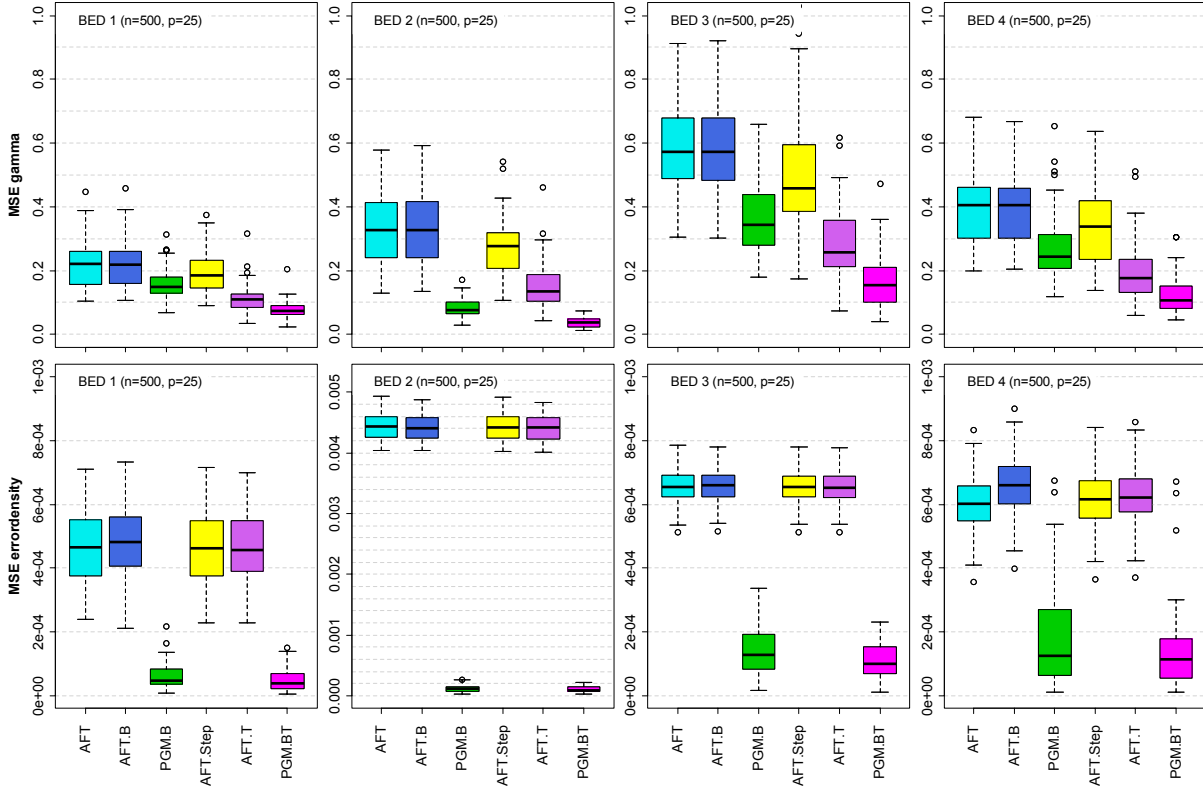


Figure S.10.9: Mean squared errors of the estimated unregularized regression coefficients, $MSE(\hat{\gamma})$ (upper panel) and the associated baseline error density, $MSE(\hat{f}_{y_0})$ (lower panel), in the AFT model with baseline error distribution BED 1 to BED 4 and $p_x = 25$ covariates and $n = 500$ observations. AFT: Frequentistic AFT model with Gaussian error, AFT.Step: Frequentistic AFT model with Gaussian error and stepwise selection, AFT.T: Frequentistic AFT model with Gaussian error and true predictor, PGM.BT: Bayesian AFT model with PGM error and true predictor.

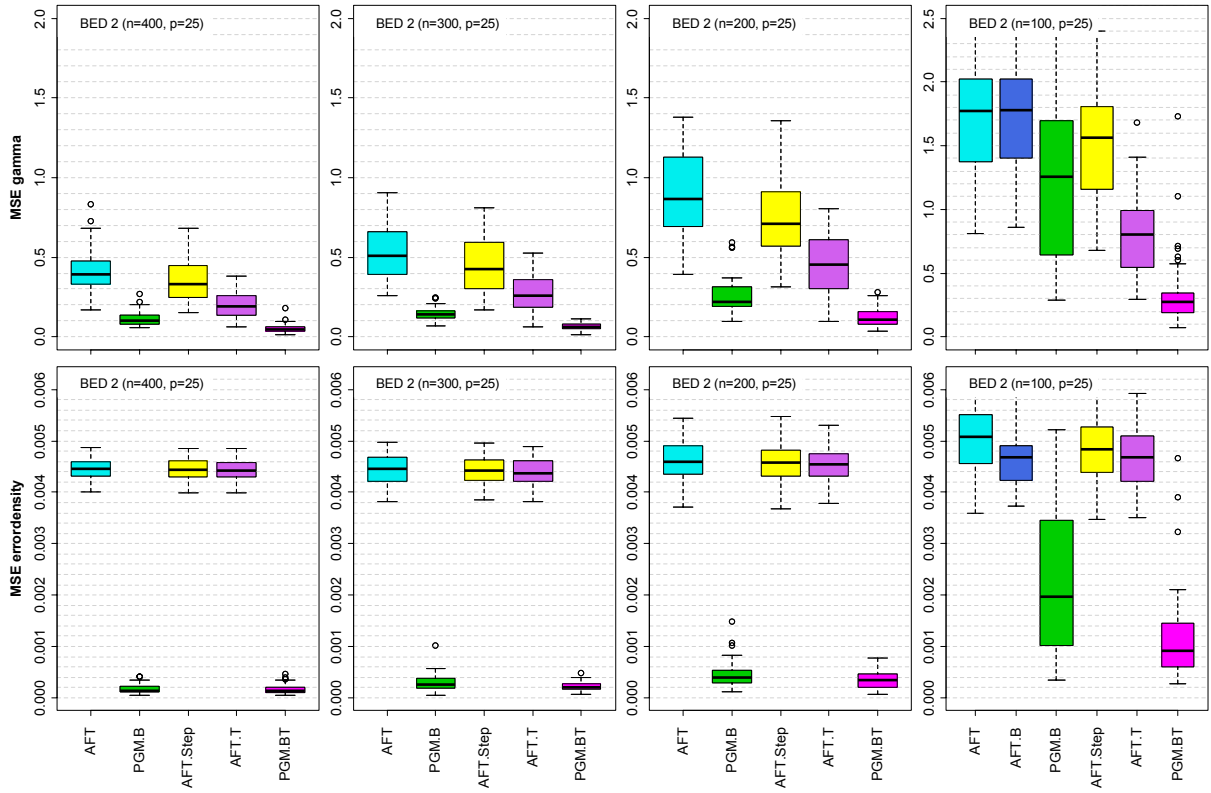


Figure S.10.10: Mean squared errors of the estimated unregularized regression coefficients, $MSE(\hat{\gamma})$ (upper panel) and the associated baseline error density, $MSE(\hat{f}_{Y_0})$ (lower panel), in the AFT model with baseline error distribution BED 2 and $p_x = 25$ covariates and $n = 500$ to $n = 100$ observations. AFT: Frequentistic AFT model with Gaussian error, AFT.Step: Frequentistic AFT model with Gaussian error and stepwise selection, AFT.T: Frequentistic AFT model with Gaussian error and true predictor, PGM.BT: Bayesian AFT model with PGM error and true predictor.

Misclassification

sliceR0	BED 1, n = 500		BED 2, n = 500		BED 3, n = 500		BED 4, n = 500	
	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$
BEST	0	0	0	0	0	0	0	0
CPL.Step	2.12	4.46	2.54	3.34	3.00	3.88	2.66	3.92
AFT.Step (logis)	1.84	2.20	2.26	2.32	2.88	2.92	2.26	2.28
AFT.Step	1.98	2.30	2.42	2.34	2.92	2.60	2.48	2.42
PGM.B-HS.STD	1.36	4.00	0.76	4.40	2.14	4.22	1.86	3.60
PGM.BL-HS.STD	1.34	3.36	0.76	4.10	2.14	3.40	1.94	3.08
PGM.BR-HS.STD	1.32	3.82	0.78	4.72	2.02	4.28	1.84	3.72
PGM.BN-HS.STD	1.24	3.20	0.70	4.02	2.10	3.00	1.88	3.00
PGM.B-HS.CRI	2.72	0.46	2.08	0.76	3.56	0.46	3.32	0.62
PGM.BL-HS.CRI	2.68	0.36	2.16	0.46	3.72	0.28	3.38	0.46
PGM.BR-HS.CRI	2.70	0.54	2.12	0.70	3.60	0.50	3.26	0.60
PGM.BN-HS.CRI	2.68	0.30	2.20	0.62	3.76	0.16	3.36	0.36
PGM.BN-HS.IND	5.94	0.00	5.98	0.00	6.02	0.00	5.98	0.00

Table S.10.1: Average number of incorrectly classified coefficients for the AFT models under baseline error distributions BED 1 to BED 4 with $n = 500$ observations after variable selection. Displayed are the results under the “*sliceR0*” update scheme for the transformed error weights. Especially $\hat{\beta} = 0, \beta \neq 0$ denotes the case that the estimated effect is zero ($\hat{\beta} = 0$) when corresponding true effect is nonzero ($\beta \neq 0$) and $\hat{\beta} \neq 0, \beta = 0$ denotes the case that the estimated effect is nonzero ($\hat{\beta} \neq 0$) when corresponding true effect is zero ($\beta = 0$).

sliceR0	BED 2, n=400		BED 2, n=300		BED 2, n=200		BED 2, n=100	
	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$
BEST	0	0	0	0	0	0	0	0
CPL.Step	2.70	3.30	2.70	3.54	3.36	3.80	3.82	4.40
AFT.Step (logis)	2.38	2.56	2.70	2.56	3.30	2.64	3.60	3.82
AFT.Step	2.36	2.46	2.66	2.52	3.18	2.44	3.76	3.56
PGM.B-HS.STD	0.92	4.46	1.20	4.04	1.74	3.94	2.68	4.48
PGM.BL-HS.STD	0.92	3.70	1.26	3.62	1.82	3.26	2.82	3.76
PGM.BR-HS.STD	0.86	4.42	1.18	4.12	1.72	3.96	2.68	4.40
PGM.BN-HS.STD	0.84	3.74	1.24	3.48	1.74	3.10	3.00	2.76
PGM.B-HS.CRI	2.06	0.52	2.68	0.62	3.00	0.54	4.80	1.14
PGM.BL-HS.CRI	2.08	0.46	2.68	0.38	3.10	0.32	4.80	0.46
PGM.BR-HS.CRI	2.06	0.64	2.66	0.52	3.08	0.56	4.66	1.04
PGM.BN-HS.CRI	2.08	0.48	2.70	0.36	3.12	0.26	4.72	0.16
PGM.BN-HS.IND	5.98	0.00	5.94	0.00	5.94	0.00	6.04	0.00

Table S.10.2: Average number of incorrectly classified coefficients for the AFT models under baseline error distributions BED 2 with $n = 400$ to $n=100$ observations after variable selection. Displayed are the results under the “*sliceR0*” update scheme for the transformed error weights. Especially $\hat{\beta} = 0, \beta \neq 0$ denotes the case that the estimated effect is zero ($\hat{\beta} = 0$) when corresponding true effect is nonzero ($\beta \neq 0$) and $\hat{\beta} \neq 0, \beta = 0$ denotes the case that the estimated effect is nonzero ($\hat{\beta} \neq 0$) when corresponding true effect is zero ($\beta = 0$).

S.10.3. High-dimensional predictor

Misclassification

sliceR0	BED 2		BED 2		BED 2		BED 2	
	n=200, p=100		n=500, p=250		n=200, p=300		n=300, p=400	
	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$
BEST	0	0	0	0	0	0	0	0
AFT.Step	0.10	0.23	-	-	-	-	-	-
PGM.BN-HS.STD	0.12	0.10	0.09	0.13	0.33	0.04	0.28	0.04
PGM.BN-HS.CRI	0.20	0.01	0.16	0.02	0.37	0.01	0.33	0.01
PGM.BN-HS.IND	0.25	0.00	0.24	0.00	0.34	0.03	0.31	0.01

Table S.10.3: Average fraction of incorrectly classified coefficients for the AFT models under baseline error distributions BED 2 after variable selection. Displayed are the results under the “*sliceR0*” update scheme. Especially $\hat{\beta} = 0, \beta \neq 0$ denotes the case that the estimated effect is zero ($\hat{\beta} = 0$) when corresponding true effect is nonzero ($\beta \neq 0$) and $\hat{\beta} \neq 0, \beta = 0$ denotes the case that the estimated effect is nonzero ($\hat{\beta} \neq 0$) when corresponding true effect is zero ($\beta = 0$).

S.11. Simulations: CRR-Type-Models

Provided are extended results to the CRR models CRR 1 to CRR 4.

S.11.1. Low-dimensional linear predictor

Regression coefficients for model CRR 1

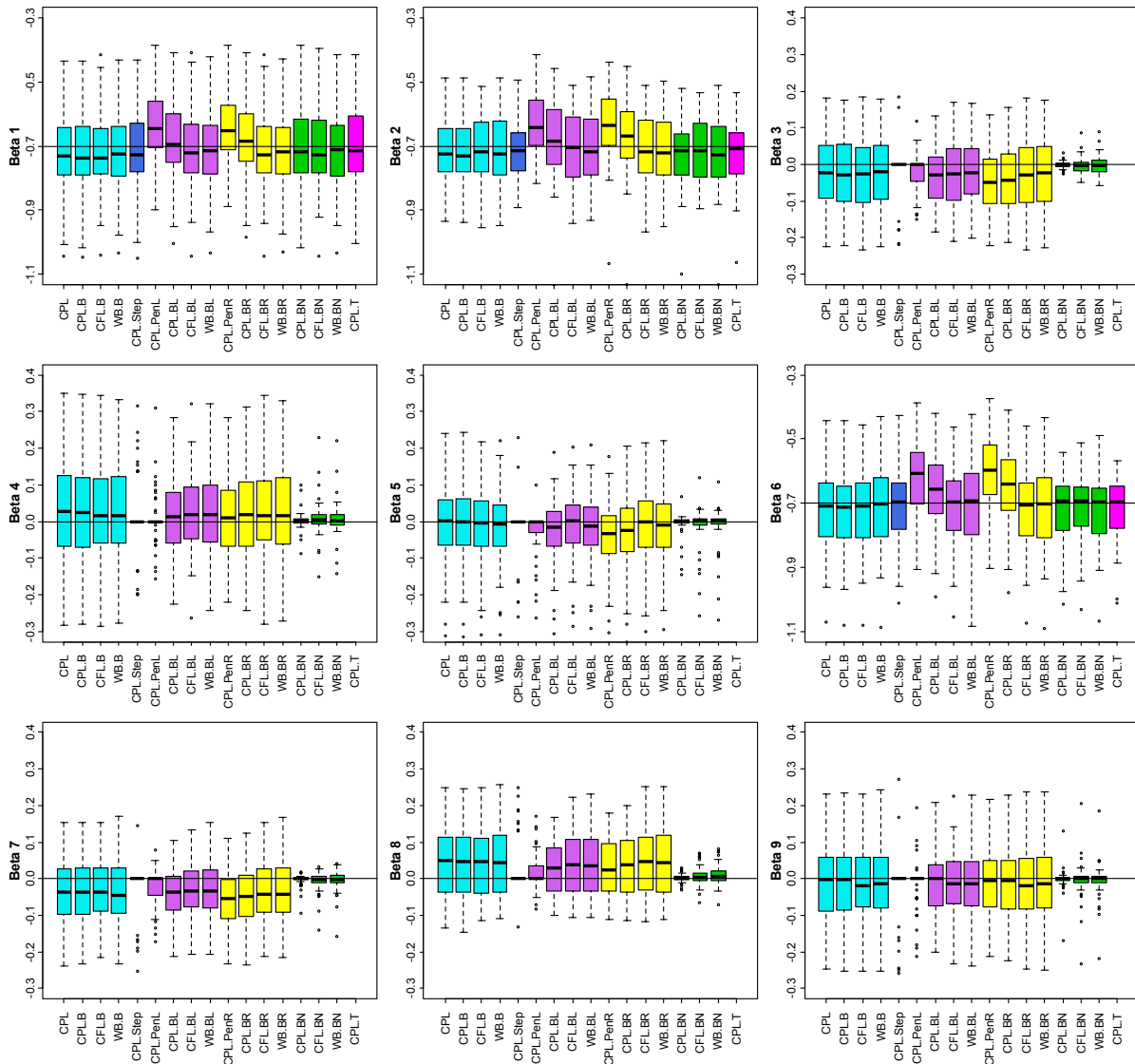


Figure S.11.1: Regression coefficient estimates $\hat{\beta}$ under different regularization priors in simulation model CRR 1. The black horizontal lines in the box plots mark the values of the true regression coefficients.

Regression coefficients for model CRR 2

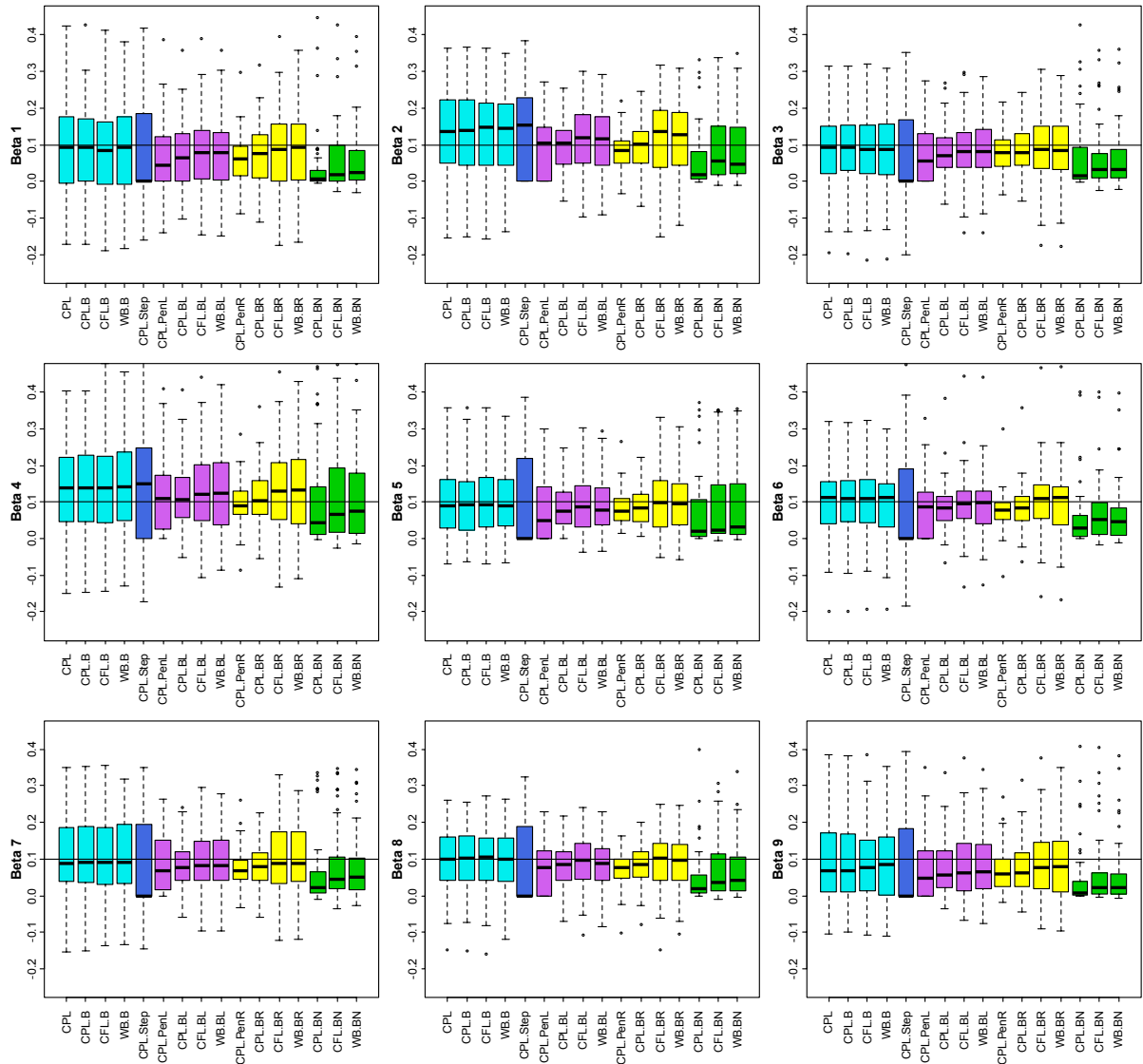


Figure S.11.2: Regression coefficient estimates $\hat{\beta}$ under different regularization priors in simulation model CRR 2. The black horizontal lines in the box plots mark the values of the true regression coefficients.

Penalty with the full likelihood for model CRR 2

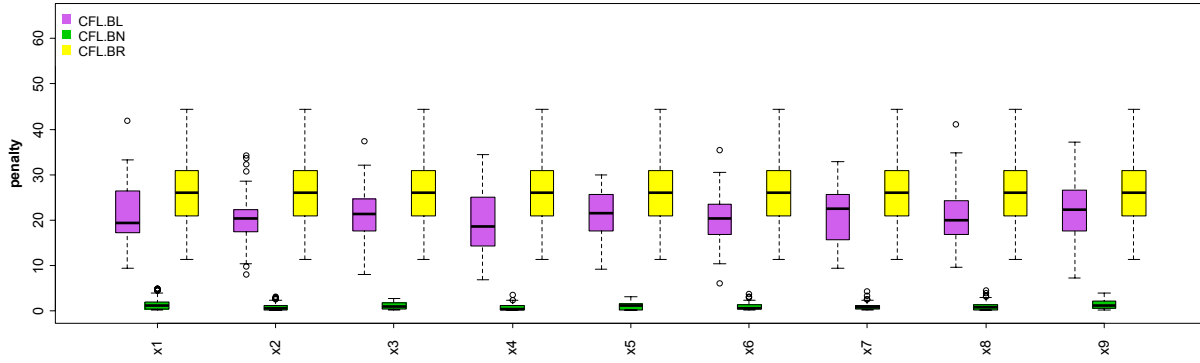


Figure S.11.3: Estimates of the covariate specific penalty $\hat{\tau}_{\beta_j}^{-2}$ for the Bayesian lasso (CFL.BL), NMIG (CFL.BN) and ridge (CFL.BR) prior in simulation model CRR 2 under the full likelihood.

Shrinkage parameter for model CRR 2

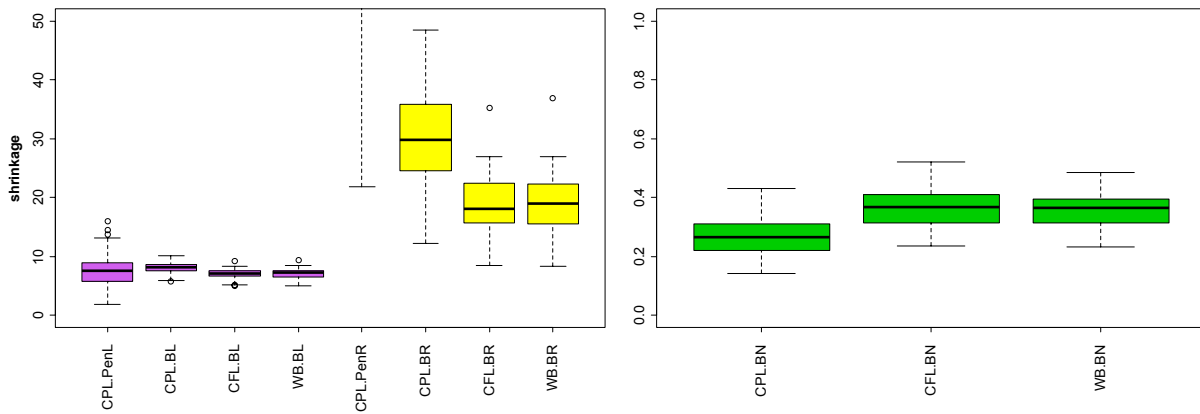


Figure S.11.4: Shrinkage parameters estimates based on the posterior mean in simulation model CRR 2. Left side: Shrinkage parameter λ^2 and λ of the frequentist and Bayesian lasso and ridge prior. Right side: Shrinkage parameter ω of the Bayesian NMIG prior.

Regression coefficients for model CRR 3

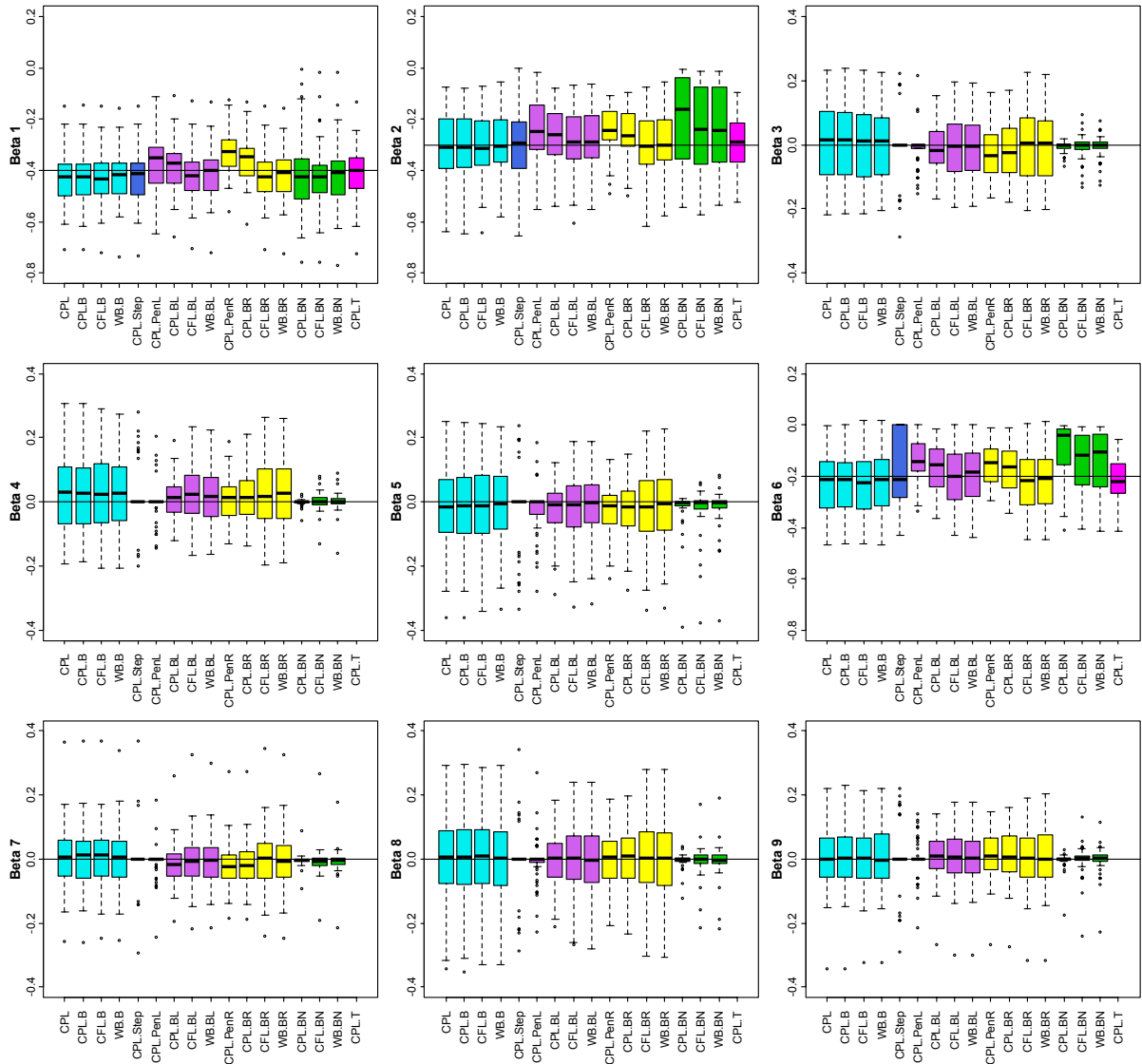


Figure S.11.5: Regression coefficient estimates $\hat{\beta}$ under different regularization priors in simulation model CRR 3. The black horizontal lines in the box plots mark the values of the true regression coefficients.

Baseline hazard and cumulative baseline hazard for model CRR 3

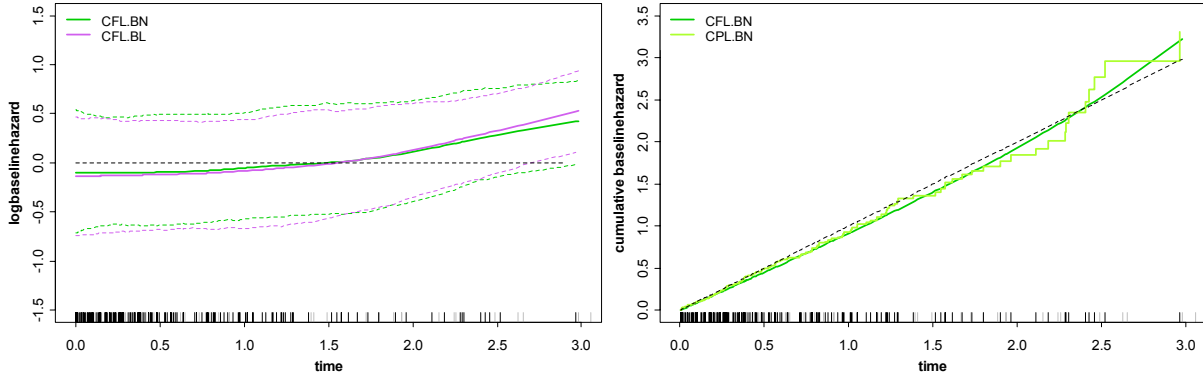


Figure S.11.6: Estimation of the log-baseline hazard $\log \hat{\lambda}_0(t)$ (left side) and the cumulative baseline hazard $\hat{\Lambda}_0(t)$ (right side) for one selected dataset under simulation model CRR 3. Left side: Posterior mean estimate of the log-baseline hazard (solid lines) based on the full likelihood together with the 2.5% and 97.5% pointwise credible bands (dashed lines) for the CFL.BL and CFL.BN model when baseline is modeled as P-spline. Right panel: Posterior mean estimate of the Cumulative baseline hazard under the Bayesian NIMG prior. In both figures the black dashed line marks the true exponential log-/cumulative baseline hazard and the vertical rugs at the time axis mark the observed event times (black) and censoring times (gray).

MSE of the cumulative baseline hazard for model CRR 3

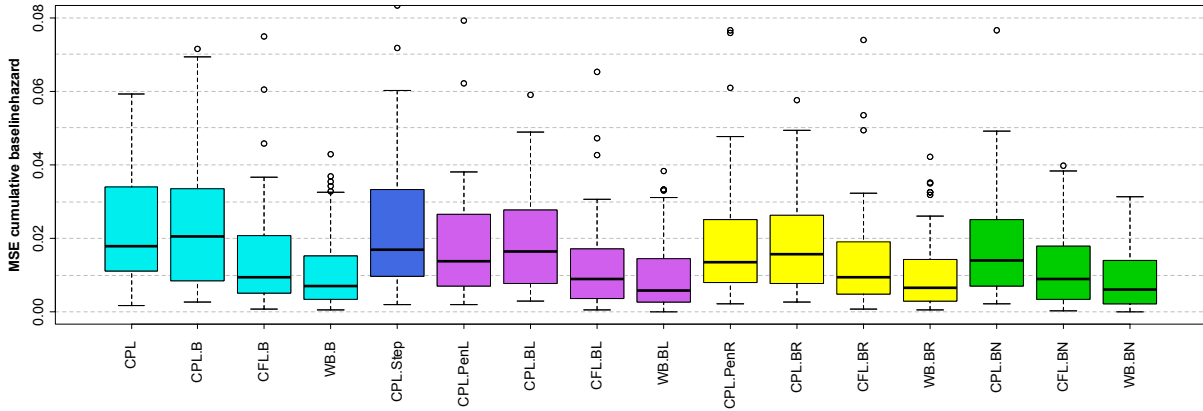


Figure S.11.7: Mean squared errors for the estimated cumulative baseline hazard, $MSE(\hat{\Lambda}_0)$, under the different regularization priors in simulation model CRR 3.

Penalty of the full likelihood for model CRR 3

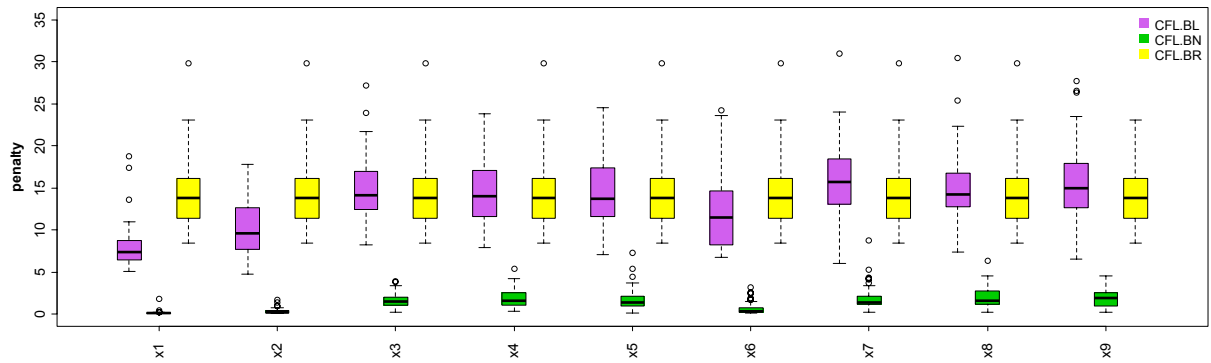


Figure S.11.8: Estimates of the covariate specific penalty $\hat{\tau}_{\beta_j}^{-2}$ for the Bayesian lasso (CFL.BL), NMIG (CFL.BN) and ridge (CFL.BR) prior in simulation model CRR 3 under the full likelihood.

Shrinkage parameter for model CRR 3

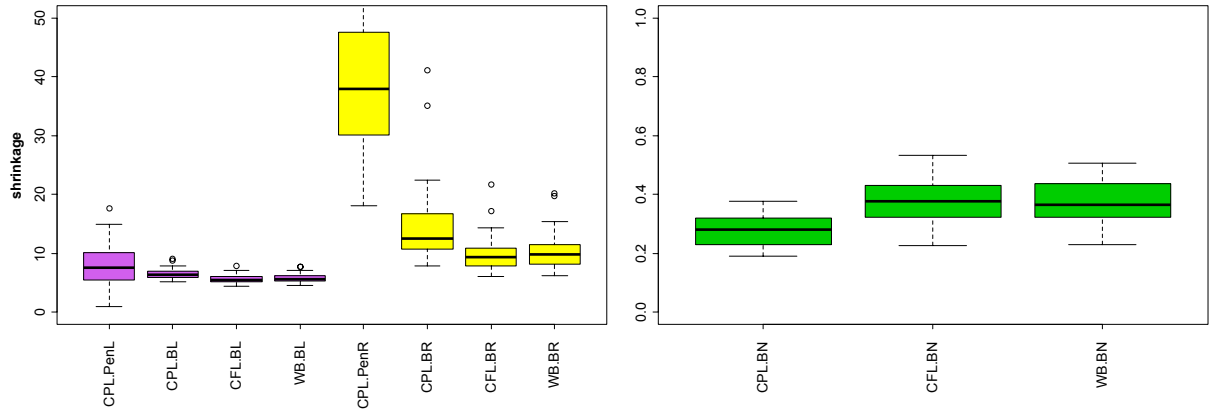


Figure S.11.9: Shrinkage parameters estimates under the different regularization methods in simulation model CRR 3. Left side: Shrinkage parameter λ^2 and λ of the frequentist and Bayesian lasso and ridge prior. Right side: Shrinkage parameter ω of the Bayesian NMIG prior.

Misclassification for models CRR1, CRR2 and CRR 3

	Model 1		Model 2		Model 3	
	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$
BEST	0	0	0	0	0	0
CPL.Step	0	1.10	5.06	0	0.34	1.42
CPL.PenL	0	2.40	2.58	0	0.12	2.14
CFL.B-HS.STD	0	1.82	4.42	0	0.20	2.10
WB.B-HS.STD	0	1.72	4.48	0	0.22	2.06
CPL.B-HS.STD	0	1.80	4.46	0	0.22	2.14
CFL.BL-HS.STD	0	1.62	4.62	0	0.22	1.74
WB.BL-HS.STD	0	1.44	4.64	0	0.22	1.60
CPL.BL-HS.STD	0	1.30	4.96	0	0.26	1.04
CFL.BR-HS.STD	0	1.70	4.34	0	0.20	2.06
WB.BR-HS.STD	0	1.74	4.48	0	0.20	1.92
CPL.BR-HS.STD	0	1.58	4.28	0	0.24	1.48
CFL.BN-HS.STD	0	0.18	6.96	0	0.88	0.26
WB.BN-HS.STD	0	0.18	7.06	0	0.94	0.22
CPL.BN-HS.STD	0	0.02	7.90	0	1.32	0.04
CFL.B-HS.CRI	0	0.32	7.38	0	0.74	0.34
WB.B-HS.CRI	0	0.36	7.52	0	0.78	0.34
CPL.B-HS.CRI	0	0.36	7.60	0	0.74	0.36
CFL.BL-HS.CRI	0	0.26	7.68	0	0.80	0.24
WB.BL-HS.CRI	0	0.32	7.68	0	0.84	0.22
CPL.BL-HS.CRI	0	0.16	8.08	0	1.02	0.10
CFL.BR-HS.CRI	0	0.32	7.56	0	0.70	0.32
WB.BR-HS.CRI	0	0.38	7.66	0	0.82	0.32
CPL.BR-HS.CRI	0	0.24	7.96	0	0.84	0.18
CFL.BN-HS.CRI	0	0.00	8.40	0	1.46	0.02
WB.BN-HS.CRI	0	0.00	8.44	0	1.48	0.02
CPL.BN-HS.CRI	0	0.00	8.60	0	1.96	0.02
CFL.BN-HS.IND	0	0.26	6.70	0	0.86	0.30
WB.BN-HS.IND	0	0.20	6.80	0	0.88	0.28
CPL.BN-HS.IND	0	0.06	7.80	0	1.32	0.06

Table S.11.1: Average number of incorrectly classified regression coefficients for the models CRR 1, CRR 2 and CRR 3 after variable selection. Especially $\hat{\beta} = 0, \beta \neq 0$ denotes the case that the estimated effect is zero ($\hat{\beta} = 0$) when corresponding true effect is nonzero ($\beta \neq 0$) and $\hat{\beta} \neq 0, \beta = 0$ denotes the case that the estimated effect is nonzero ($\hat{\beta} \neq 0$) when corresponding true effect is zero ($\beta = 0$).

S.11.2. Low-dimensional nonlinear predictor

In the Section 11.2 with the CRR simulations the following results for model CRR 4.a are omitted.

Regression coefficients for model CRR 4.a

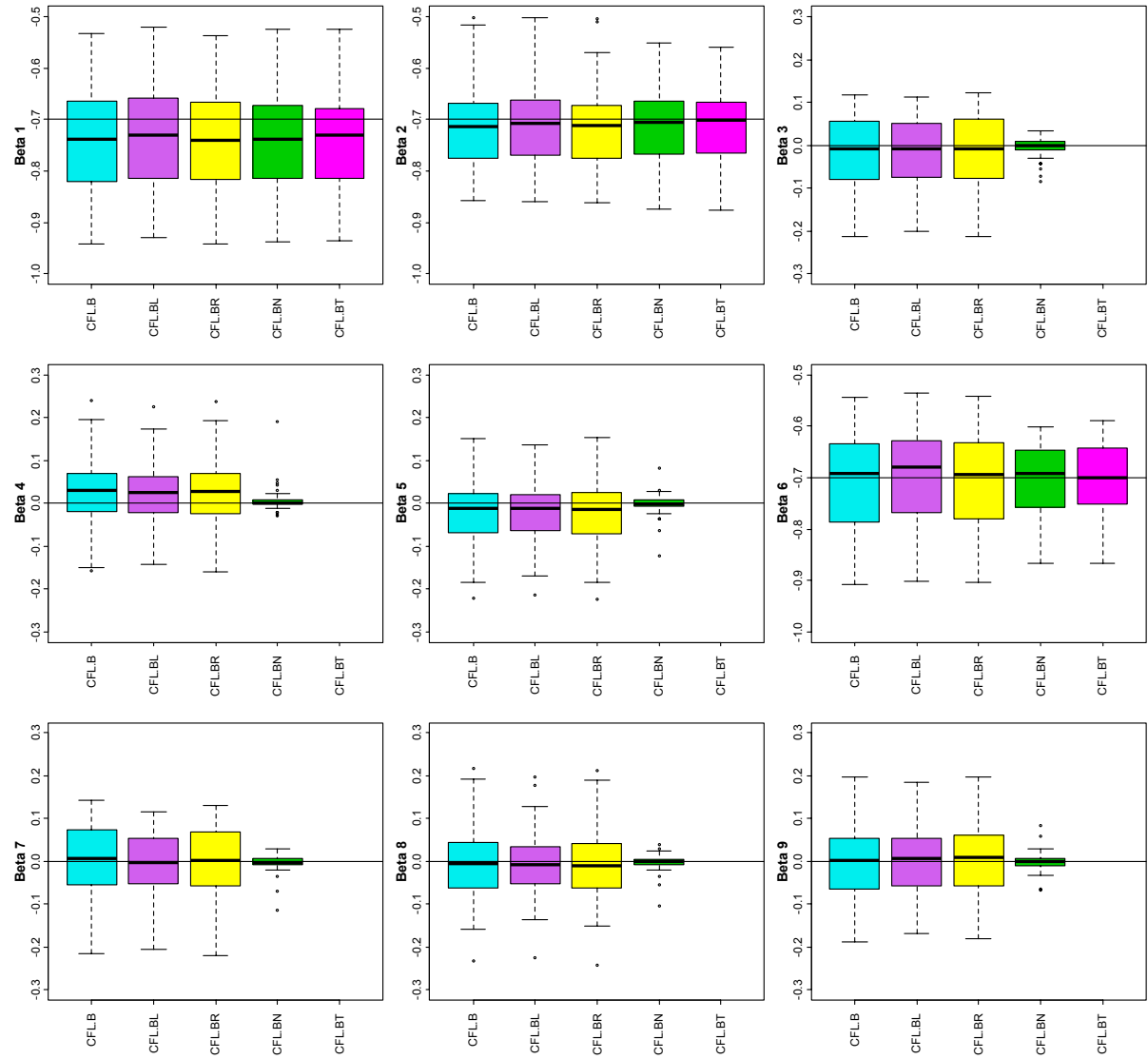


Figure S.11.10: Regression coefficient estimates $\hat{\beta}$ under different regularization priors in simulation model CRR 4.a. The black horizontal lines in the box plots mark the values of the true regression coefficients.

MSE of the regression coefficients for model 4.a

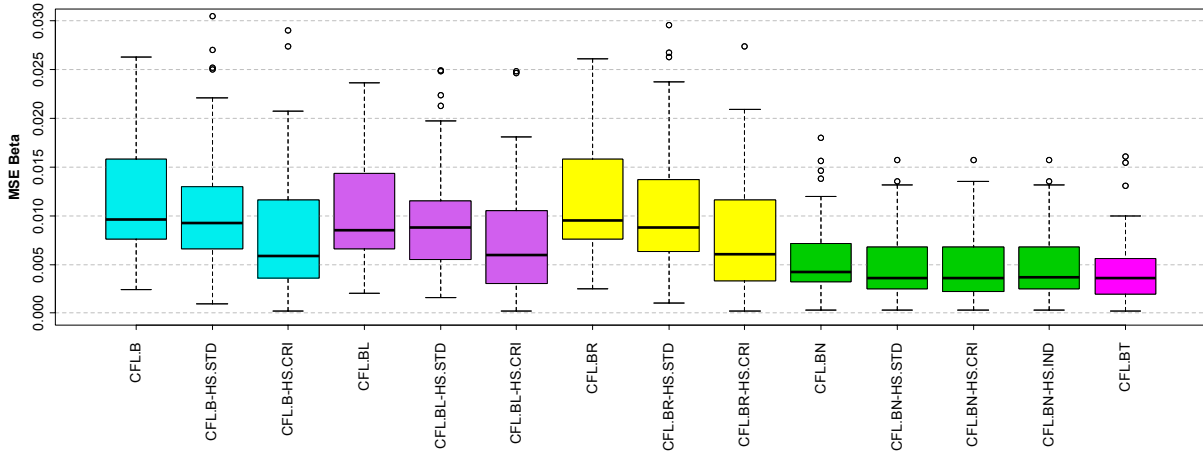


Figure S.11.11: Mean squared errors the regression coefficient estimates $\hat{\beta}$ under the different regularization and variable selection methods in simulation model CRR 4.a. The right box (CFL.BT) shows the MSE for the estimations when the true predictor structure is used.

NMIG indicators and penalty of the regression coefficients for model 4.a

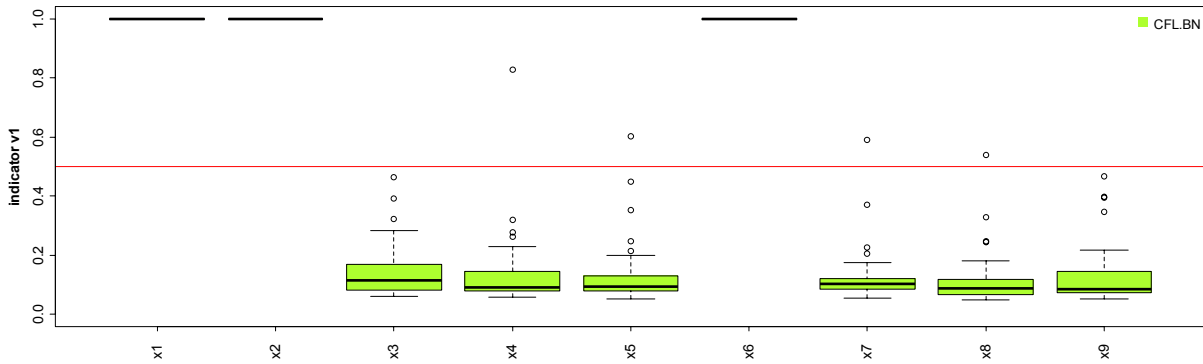


Figure S.11.12: Posterior relative frequencies of the indicator variable value $I_j = v_1$ under the Bayesian NMIG prior for simulation model CRR 4.a based on the full likelihood (CFL.BN). The red horizontal line marks the cut off value 0.5 of the hard shrinkage selection criterion HS.IND.

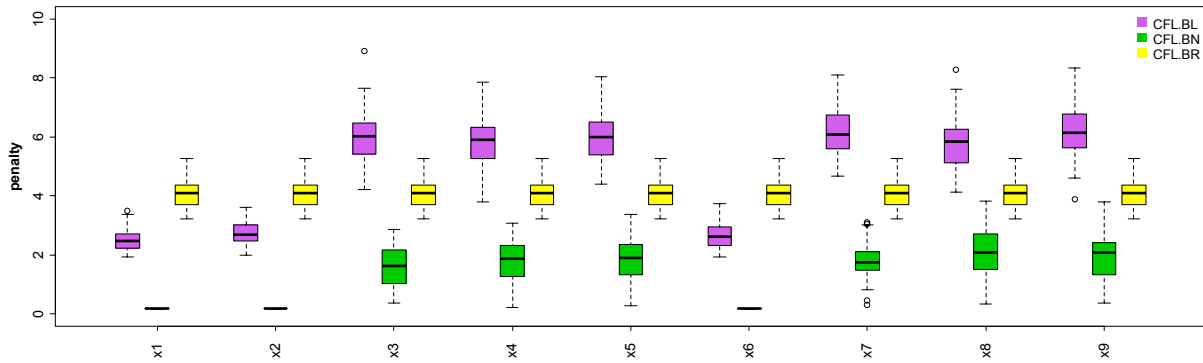


Figure S.11.13: Estimates of the covariate specific penalty $\hat{\tau}_{\beta_j}^{-2}$ for the Bayesian lasso (CFL.BL), NMIG (CFL.BN) and ridge (CFL.BR) prior in simulation model CRR 4.a under the full likelihood.

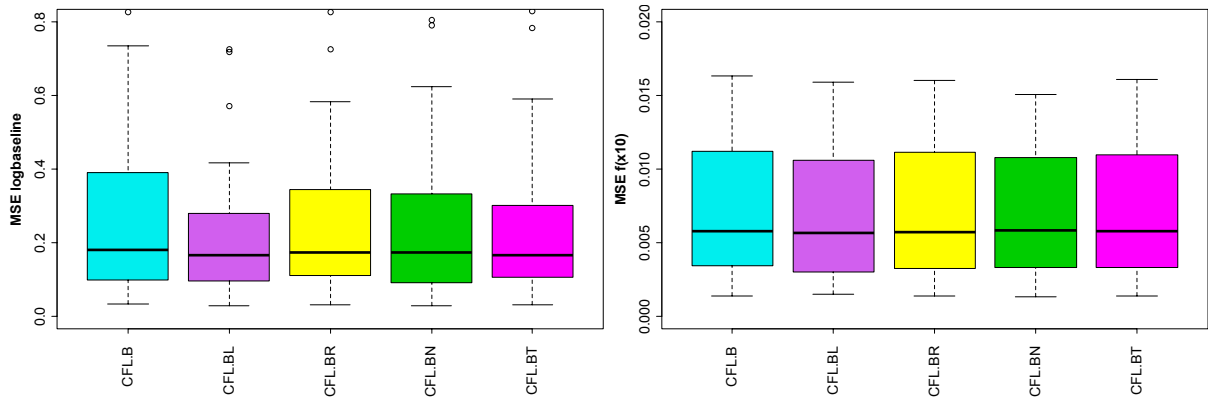
MSE of the log-baseline, MSE of the nonlinear effect and DIC for model 4.a

Figure S.11.14: Mean squared errors for the estimated baseline hazard $\hat{\lambda}_0$ (left side) and the nonlinear effect $\hat{f}(x_{10})$ (right side) under the different regularization priors in simulation model CRR 4.a.

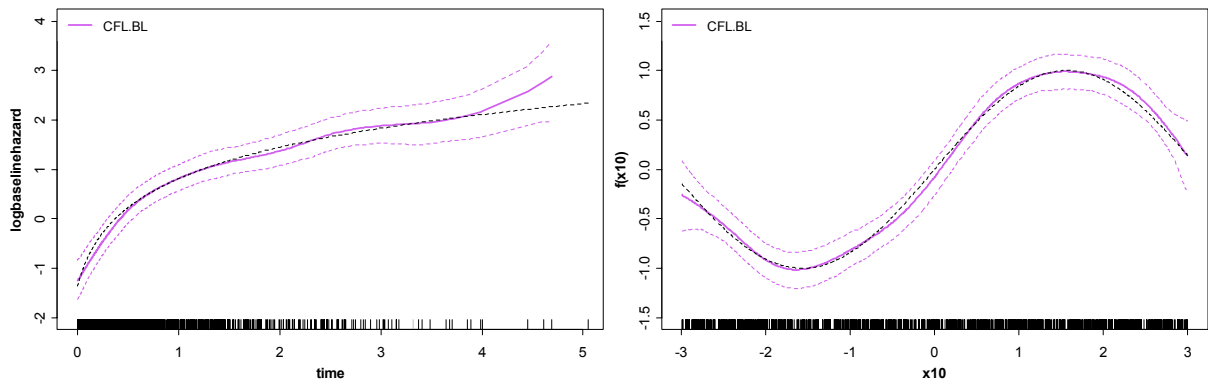


Figure S.11.15: Estimate of the log-baseline hazard $\log \hat{\lambda}_0(t)$ (left side) and the nonlinear effect $\hat{f}(x_{10})$ (right side) under the Bayesian lasso regularization in simulation model CRR 4.a for one selected data set. Left side: Estimation of the log-baseline (solid green line) together with the 95% pointwise credible bands (dashed green lines). Right side: Estimation of the nonlinear effect (solid green line) together with the 95% pointwise credible bands (dashed green lines). In both figures the black dashed line marks the true log baseline hazard and nonlinear effect and the vertical rugs at the time axis mark the observed event times (black) and censoring times (gray).

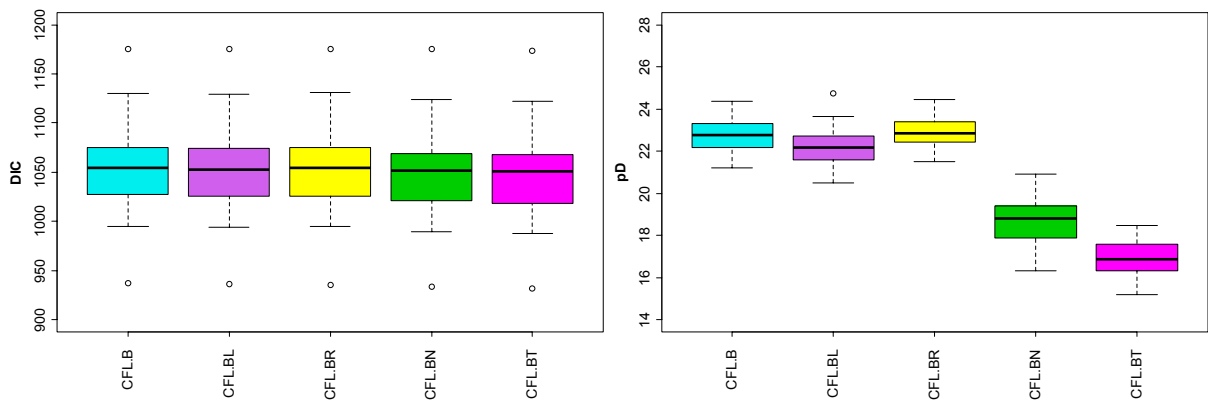


Figure S.11.16: Deviance Information Criterion DIC (left side) and the effective number of parameters pD (right side) under the different regularization priors for simulation model CRR 4.a. The right box (CFL.BT) shows the results when the true predictor structure is used.

Regression coefficients for model 4.b

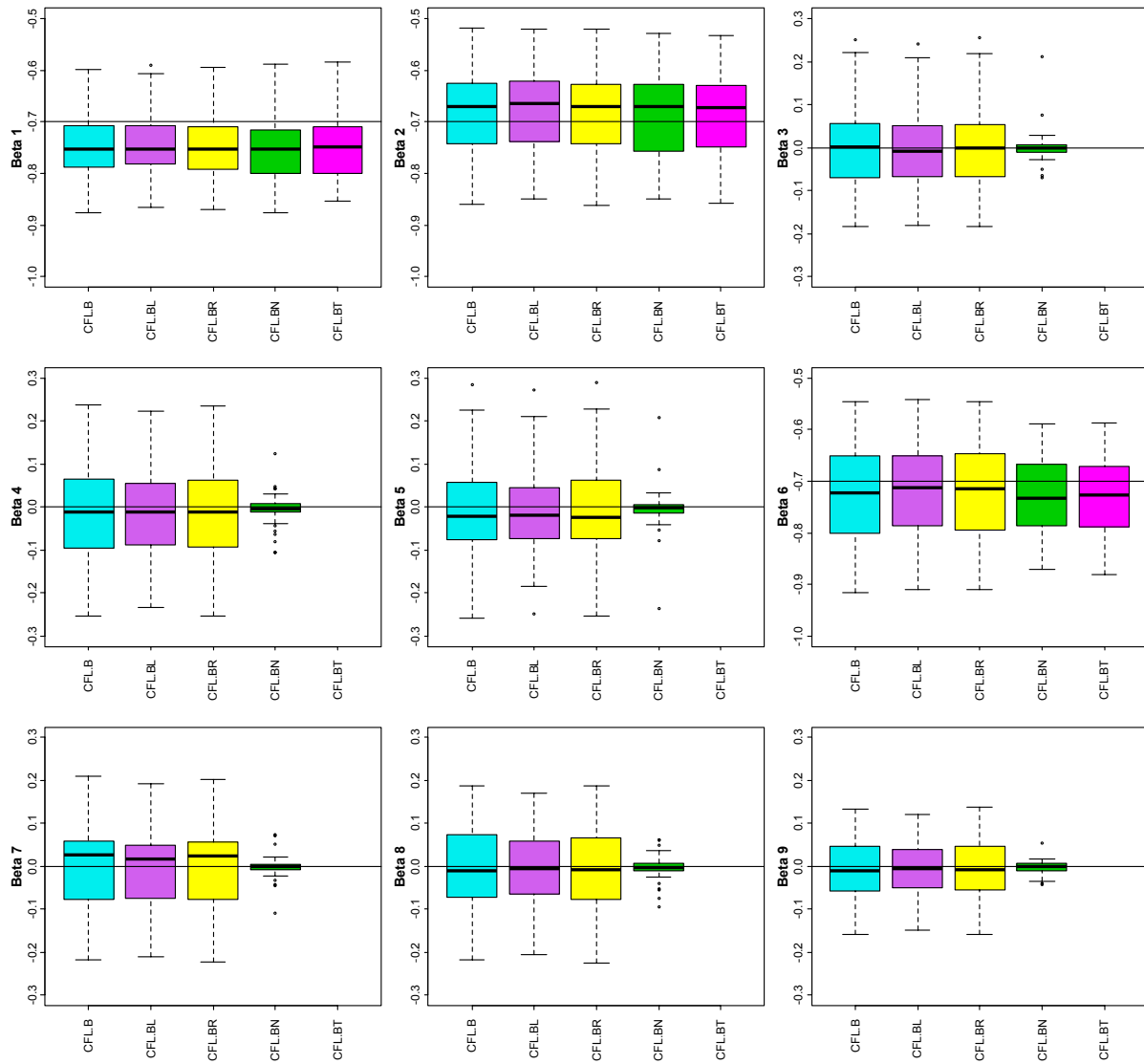


Figure S.11.17: Regression coefficient estimates $\hat{\beta}$ under different regularization priors in simulation model CRR 4.b. The black horizontal lines mark the values of the true effects. The right box (CFL.BT) shows the estimations when the true predictor structure is used.

Classification

	Model 4.a (CFL)			Model 4.b (CFL)			Model 4.b (PGM)		
	$\hat{\beta} \neq 0$ $\beta \neq 0$	$\hat{\beta} = 0$ $\beta = 0$	MF	$\hat{\beta} \neq 0$ $\beta \neq 0$	$\hat{\beta} = 0$ $\beta = 0$	MF	$\hat{\beta} \neq 0$ $\beta \neq 0$	$\hat{\beta} = 0$ $\beta = 0$	MF
BEST	3	6	50	3	6	50	3	6	50
B.HS-STD	3	4.26	7	3	3.94	4	3	3.90	6
BL.HS-STD	3	4.46	8	3	4.06	5	3	4.32	10
BR.HS-STD	3	4.24	7	3	3.96	5	3	3.94	8
BN.HS-STD	3	5.94	47	3	5.90	45	3	5.92	47
B.HS-CRI	3	5.66	37	3	5.62	35	3	5.56	35
BL.HS-CRI	3	5.72	38	3	5.70	37	3	5.72	38
BR.HS-CRI	3	5.72	39	3	5.58	35	3	5.68	36
BN.HS-CRI	3	6.00	50	3	5.96	48	3	6.00	50
BN.HS-IND	3	5.92	46	3	5.82	43	3	5.92	47

Table S.11.2: Average number of correctly classified coefficients for the models CRR 4 after variable selection. CFL marks the estimates based on the full likelihood of the CRR model and PGM marks that the estimates are achieved using the AFT with PGM error distribution. Especially $\hat{\beta} \neq 0, \beta \neq 0$ denotes the case that the estimated effect is nonzero ($\hat{\beta} \neq 0$) when the corresponding true effect is nonzero ($\beta \neq 0$) and $\hat{\beta} = 0, \beta = 0$ denotes the case that the estimated effect is zero ($\hat{\beta} = 0$) when the corresponding true effect is zero ($\beta = 0$). The columns (MF) display the average frequencies of the final models that recover the true model.

Misclassification

	Model 4.a (CFL)		Model 4.b (CFL)		Model 4.b (PGM)	
	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$
BEST	0	0	0	0	0	0
B.HS-STD	0	1.74	0	2.06	0	2.10
BL.HS-STD	0	1.54	0	1.94	0	1.68
BR.HS-STD	0	1.76	0	2.04	0	2.06
BN.HS-STD	0	0.06	0	0.1	0	0.08
B.HS-CRI	0	0.34	0	0.38	0	0.44
BL.HS-CRI	0	0.28	0	0.30	0	0.28
BR.HS-CRI	0	0.28	0	0.04	0	0.32
BN.HS-CRI	0	0	0	0.24	0	0
BN.HS-IND	0	0.08	0	0.18	0	0.08

Table S.11.3: Average number of incorrectly classified regression coefficients for the models CRR 4 after variable selection. Especially $\hat{\beta} = 0, \beta \neq 0$ denotes the case that the estimated effect is zero ($\hat{\beta} = 0$) when corresponding true effect is nonzero ($\beta \neq 0$) and $\hat{\beta} \neq 0, \beta = 0$ denotes the case that the estimated effect is nonzero ($\hat{\beta} \neq 0$) when corresponding true effect is zero ($\beta = 0$).

S.11.3. Miss-specification using the AFT model

Regression coefficients

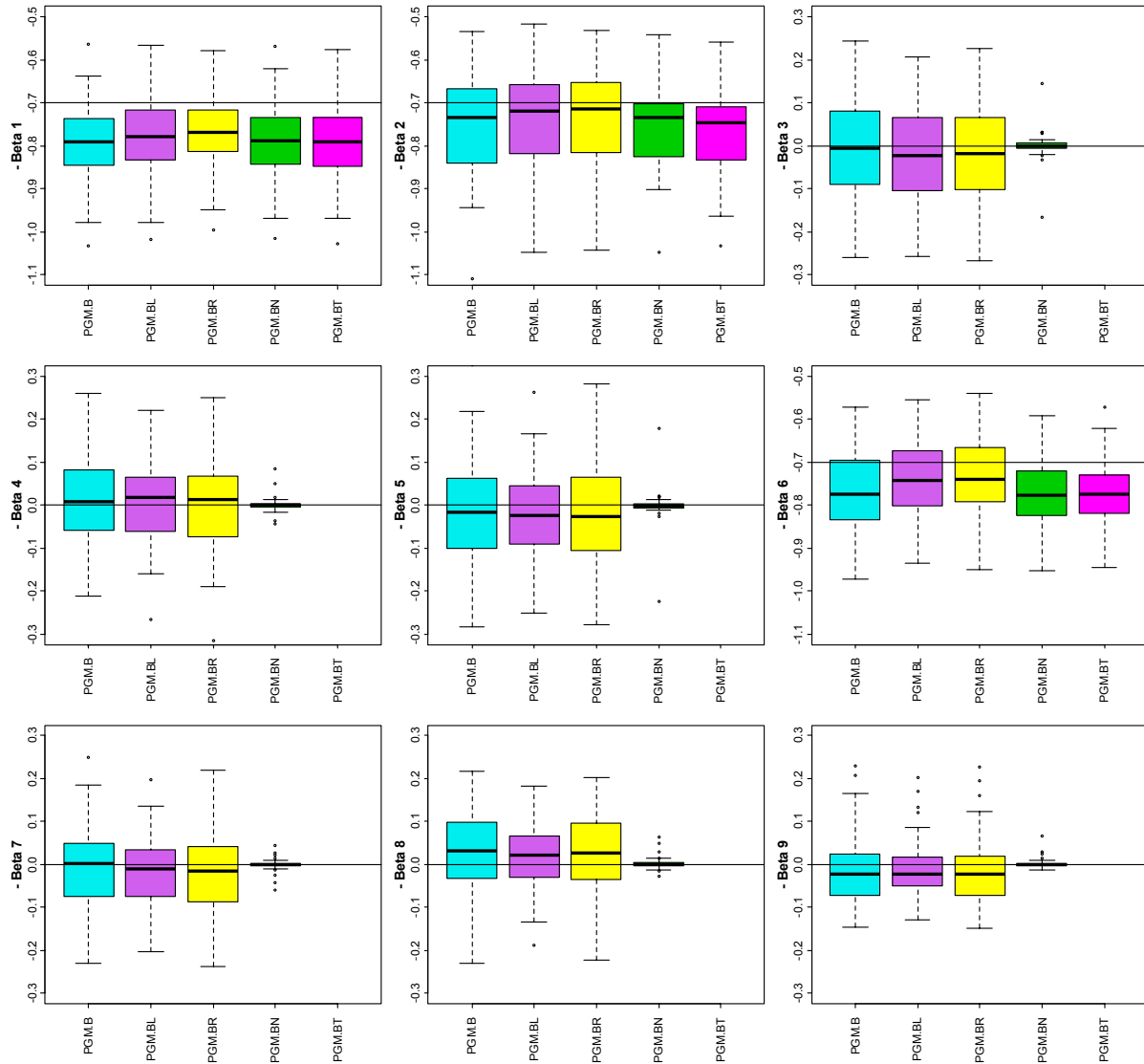


Figure S.11.18: Regression coefficient estimates $\hat{\beta}$ under different regularization priors in simulation model CRR 4.b fitted with an AFT model with PGM error distribution. The black horizontal lines mark the values of the true effects.

MSE of the nonlinear effect

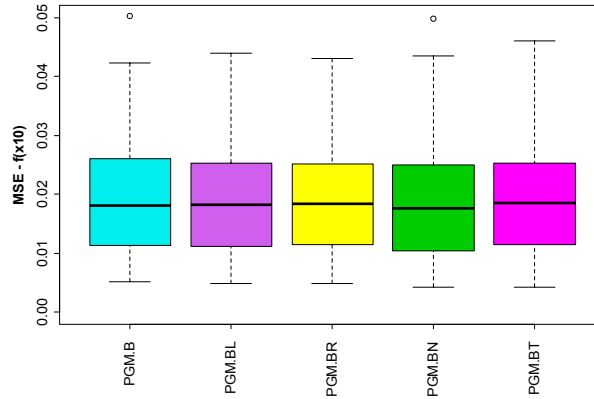


Figure S.11.19: Mean squared errors for the nonlinear effect $\hat{f}(x_{10})$ under the different regularization priors in simulation model CRR 4.b under the AFT model with PGM error.

S.11.4. High dimensional predictor

Misclassification

	p=20		p=60		p=160		p=200	
	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$	$\hat{\beta} = 0$ $\beta \neq 0$	$\hat{\beta} \neq 0$ $\beta = 0$
BEST	0	0	0	0	0	0	0	0
CPL.PenL	0.055	0.212	0.089	0.168	0.201	0.120	0.280	0.084
CPL.BL-HS.STD	0.107	0.104	0.142	0.094	0.312	0.022	0.379	0.014
CPL.BR-HS.STD	0.096	0.152	0.117	0.153	0.261	0.062	0.303	0.049
CPL.BN-HS.STD	0.213	0.008	0.270	0.014	0.357	0.026	0.396	0.025
CPL.BL-HS.CRI	0.216	0.010	0.267	0.011	0.454	0.000	0.488	0.000
CPL.BR-HS.CRI	0.199	0.017	0.235	0.029	0.432	0.001	0.468	0.000
CPL.BN-HS.CRI	0.292	0.000	0.338	0.002	0.405	0.009	0.439	0.009
CPL.BN-HS.IND	0.199	0.011	0.258	0.016	0.348	0.031	0.388	0.029

Table S.11.4: Average fraction of incorrectly classified regression coefficients for the models CRR 1, CRR 2 and CRR 3 after variable selection. Especially $\hat{\beta} \neq 0, \beta \neq 0$ denotes the case that the estimated effect is nonzero ($\hat{\beta} \neq 0$) when the corresponding true effect is nonzero ($\beta \neq 0$) and $\hat{\beta} = 0, \beta = 0$ denotes the case that the estimated effect is zero ($\hat{\beta} = 0$) when the corresponding true effect is zero ($\beta = 0$).

S.12. Application: Primary biliary cirrhosis of the liver

Provided are extended results to the “Primary biliary cirrhosis of the liver” data.

S.12.1. Weibull model (linear predictor)

In addition a parametric Weibull model $\lambda_0(t) = \alpha t^{\alpha-1}$ for the baseline hazard is considered. If a Weibull hazard rate model is assumed, the regression coefficients from the associated AFT model formulation are connected via the linear transformation $\beta_{\text{AFT}} = -\beta_{\text{CRR}} / \alpha_{\text{CRR}}$. The estimated scale parameter $\sigma_{\text{AFT}} = \alpha_{\text{CRR}}^{-1}$ has a magnitude of 0.6 so that the absolute values of the estimated regression coefficients in the AFT representation are smaller than those from the CRR formulation. Nevertheless, we found no strong evidence in the data to justify the Weibull model, so that finally the Weibull estimates differ unsystematically from those under the nonparametric CRR and AFT models. In the following figures the (s) marks this “scaled” estimates β_{AFT} in the associated AFT model.

Regression coefficients

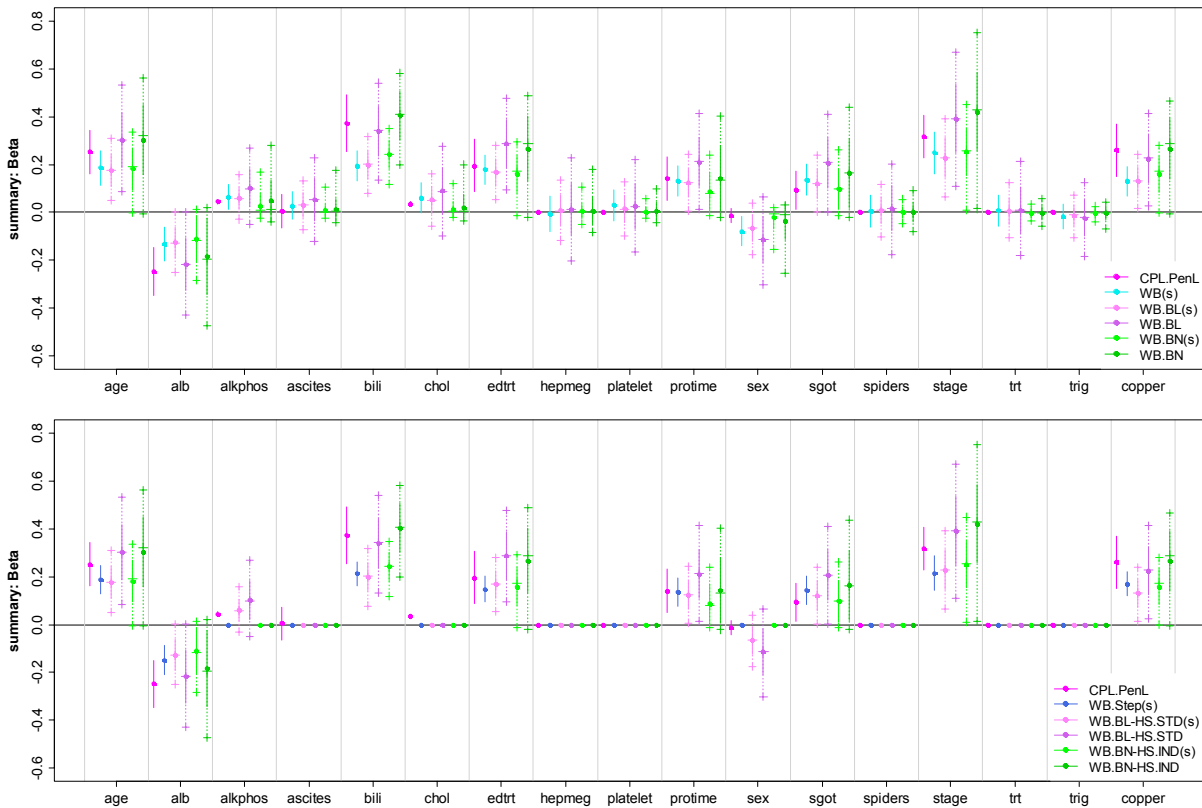


Figure S.12.1: Estimated regression coefficients without (upper panel) and with variable selection (lower panel) for the Weibull model. The points mark the estimate of the regression coefficient and the lines display the corresponding standard errors. For the Bayesian procedures the points mark the mean, the solid lines display the standard errors and the additional dashes mark the median and 95 % empirical quantiles of the marginal posterior distribution of the regression coefficients.

Bayesian NMIG posterior inclusion probability

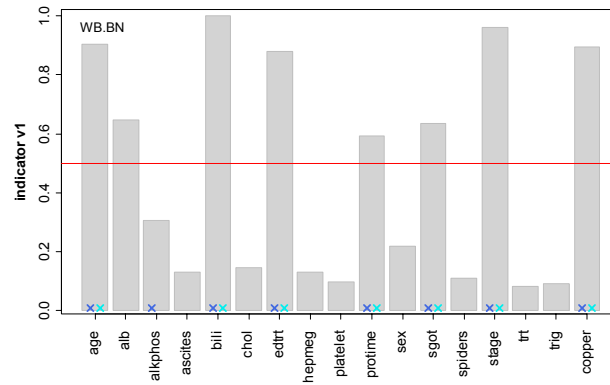


Figure S.12.2: Posterior relative frequencies of the of the Bayesian NMIG indicator variable v_1 in the Weibull model. The crosses in the bars mark the covariates from the corresponding frequentist models, which are significant with respect to the p-value 0.05 (cyan) and which are selected by the frequentist stepwise variable selection procedure (dark blue).

Baseline quantities

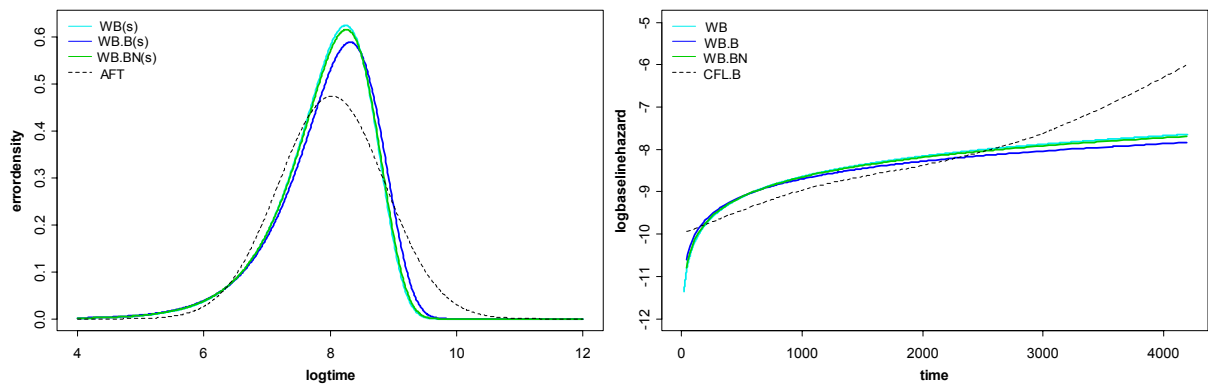


Figure S.12.3: Estimation of the baseline distribution quantities in the Weibull model. Left side: Posterior mean estimate of the baseline error density together with the frequentist estimates of the AFT model with Gaussian (AFT, black dotted line) and extreme value (WB) error distribution. Right panel: Posterior mean estimate of the log-baseline hazard function together with the estimate resulting from the Cox model with Bayesian lasso penalty (black dotted line).

S.12.2. Paths of the regression coefficients (linear predictor)

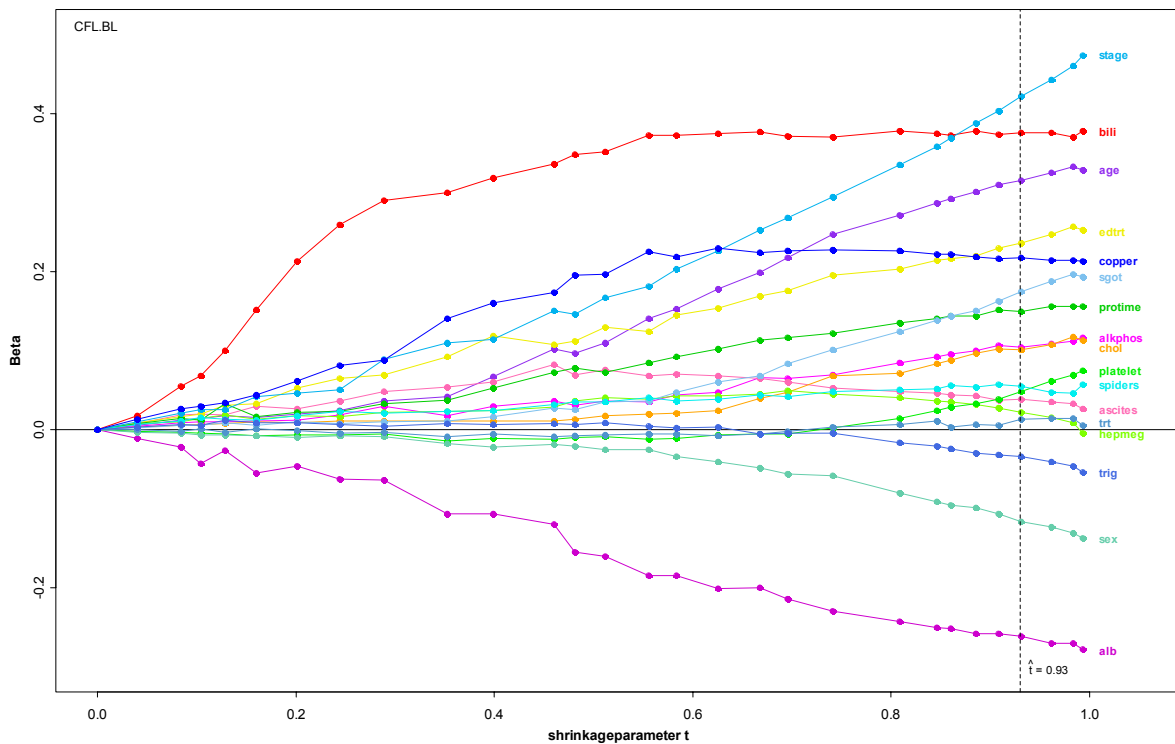


Figure S.12.4: Posterior mean coefficient estimates from the Bayesian lasso in the Cox model based on the full likelihood with P-spline hazard as a function of the standardized constraint parameter t . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the constraint parameter.

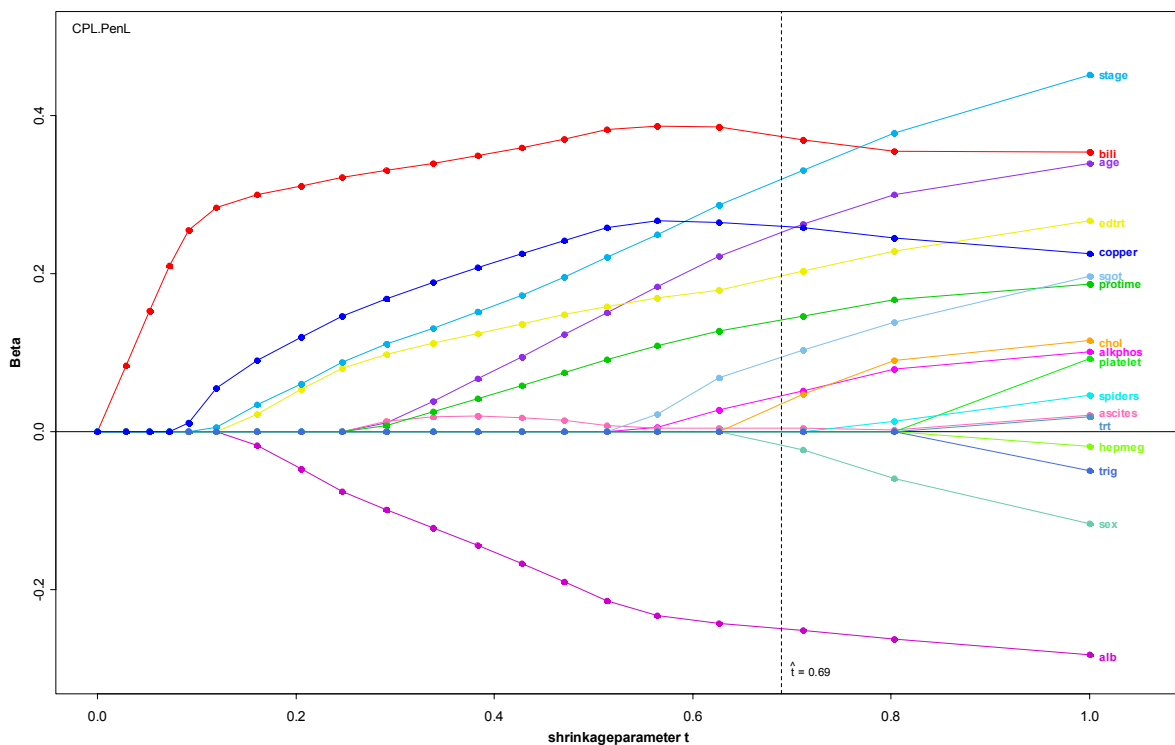


Figure S.12.5: Coefficient estimates from the frequentist lasso in the Cox model as a function of the standardized constraint parameter t . The vertical dotted line marks the coefficient estimates at the optimal value of the constraint parameter determined by crossvalidation.

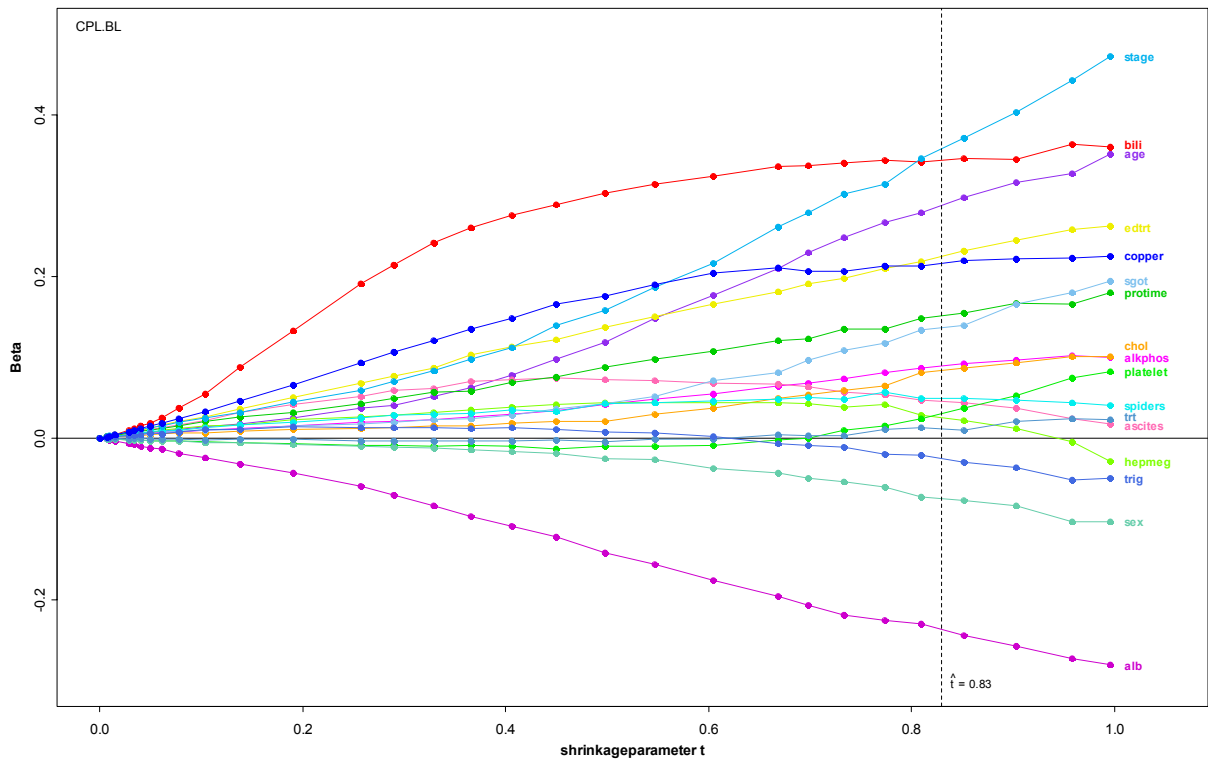


Figure S.12.6: Posterior mean coefficient estimates from the Bayesian lasso in the Cox model based on the partial likelihood as a function of the standardized constraint parameter t . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the constraint parameter.

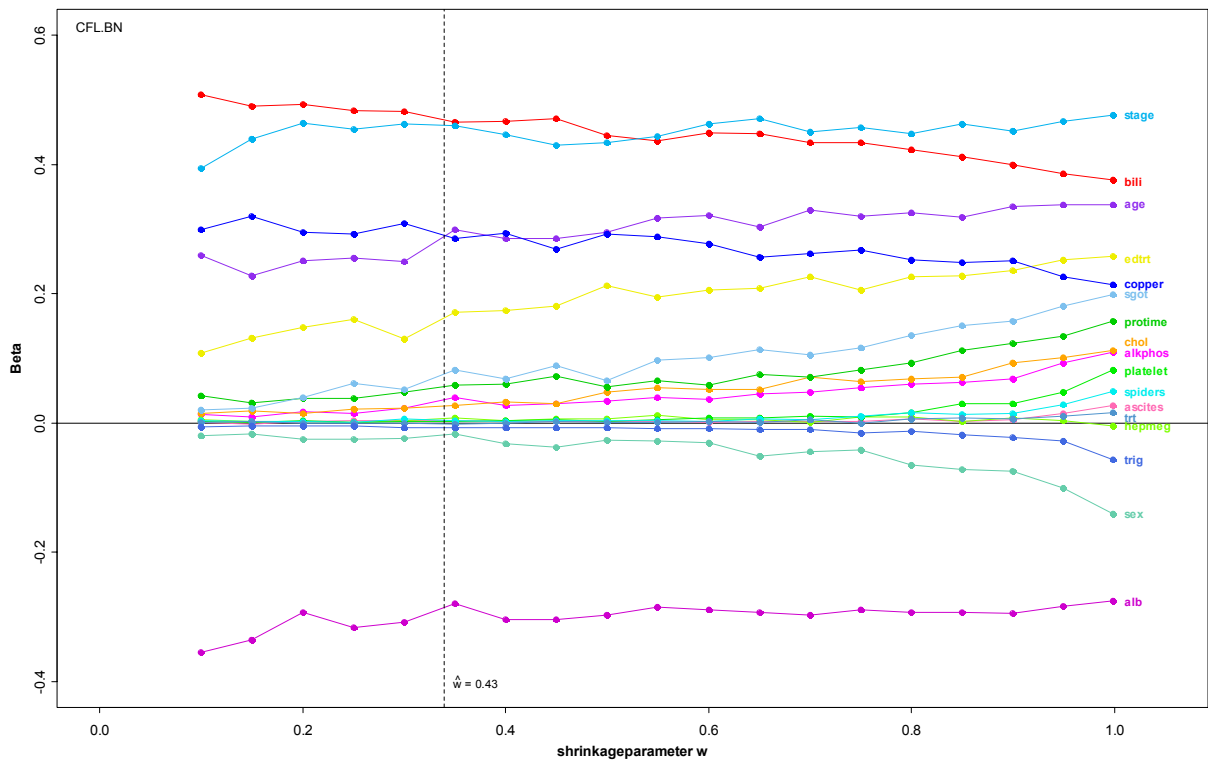


Figure S.12.7: Posterior mean coefficient estimates from the Bayesian NMIG in the Cox model based on the full likelihood with P-spline hazard as a function of the complexity parameter ω . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the complexity parameter.

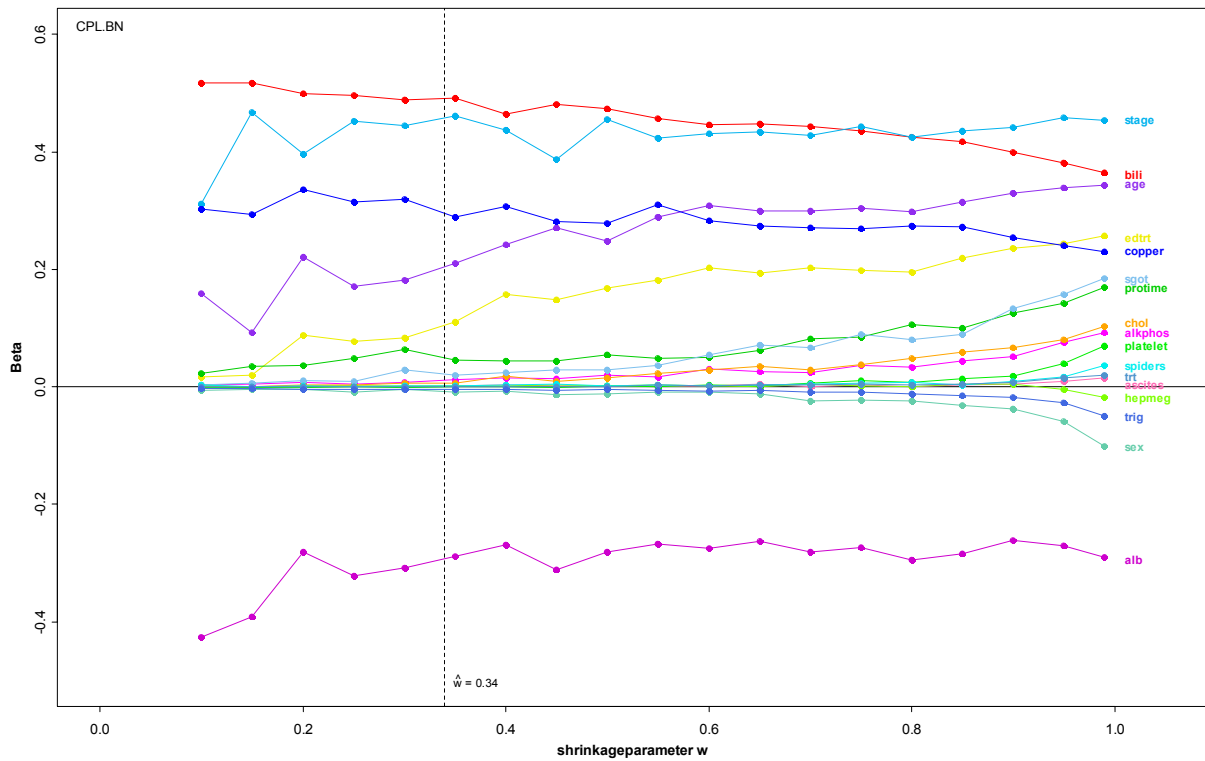


Figure S.12.8: Posterior mean coefficient estimates from the Bayesian NMIG in the Cox model based on the partial likelihood as a function of the complexity parameter ω . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the complexity parameter.

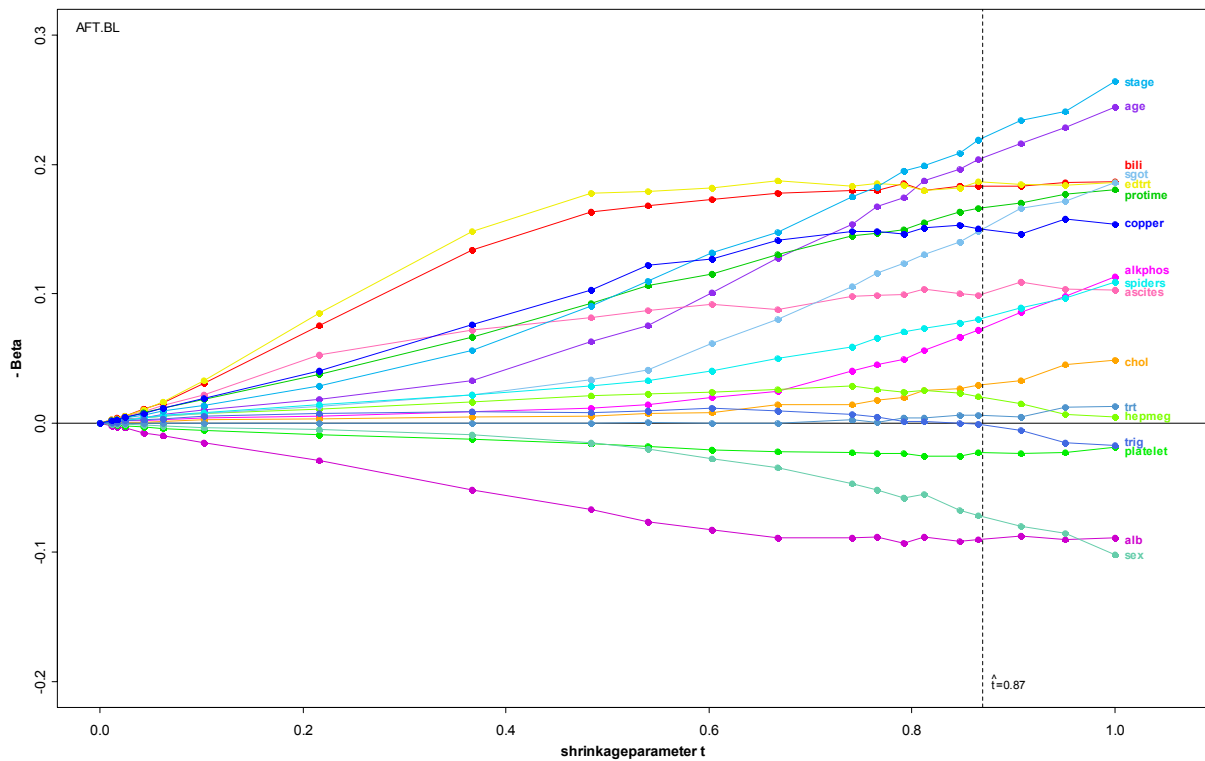


Figure S.12.9: Posterior mean coefficient estimates from the Bayesian lasso in the AFT model with Gaussian error as a function of the standardized constraint parameter t . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the constraint parameter.

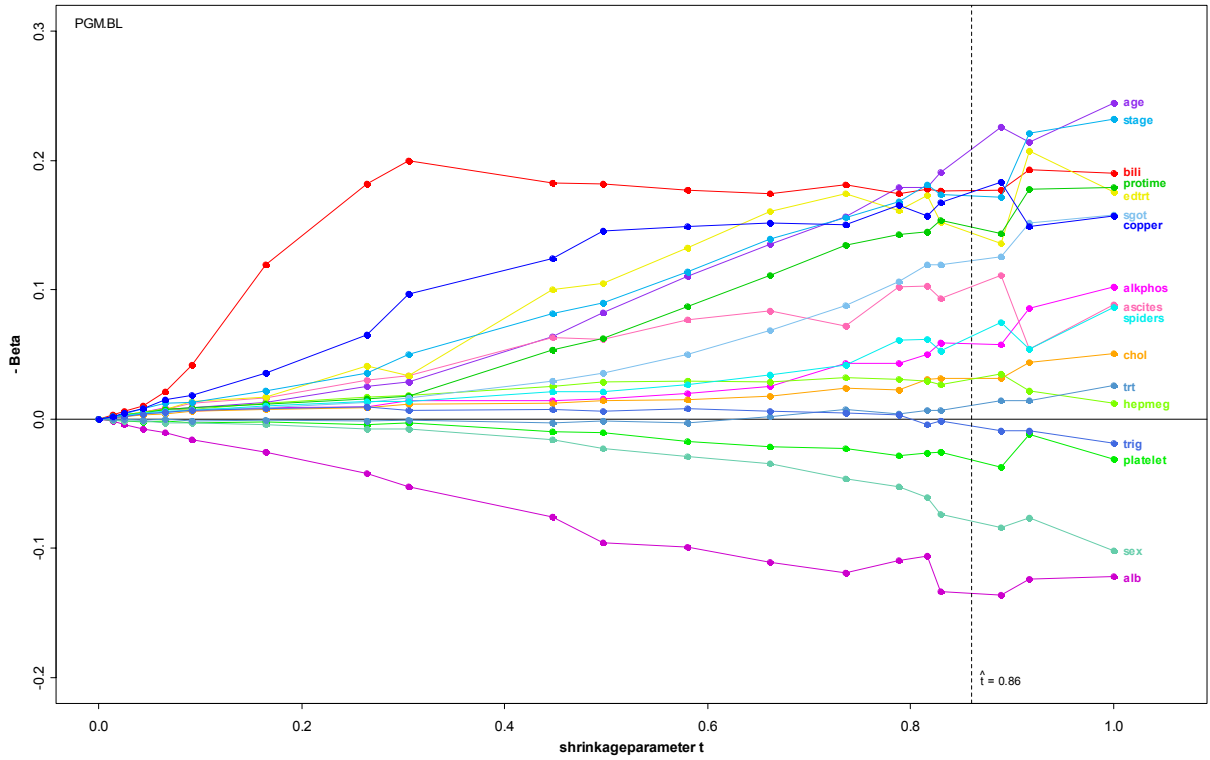


Figure S.12.10: Posterior mean coefficient estimates from the Bayesian lasso in the AFT model with PGM error as a function of the standardized constraint parameter t . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the constraint parameter.

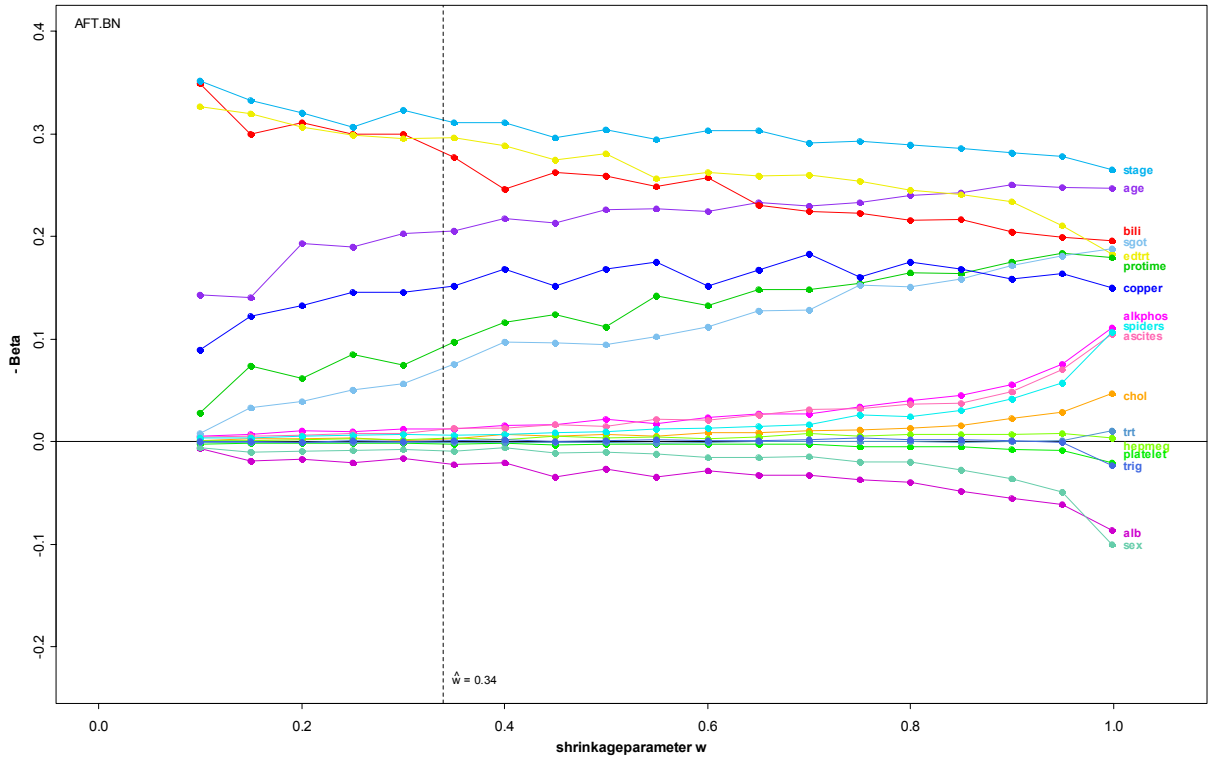


Figure S.12.11: Posterior mean coefficient estimates from the Bayesian NMIG in the AFT model with Gaussian error as a function of the complexity parameter ω . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the complexity parameter.

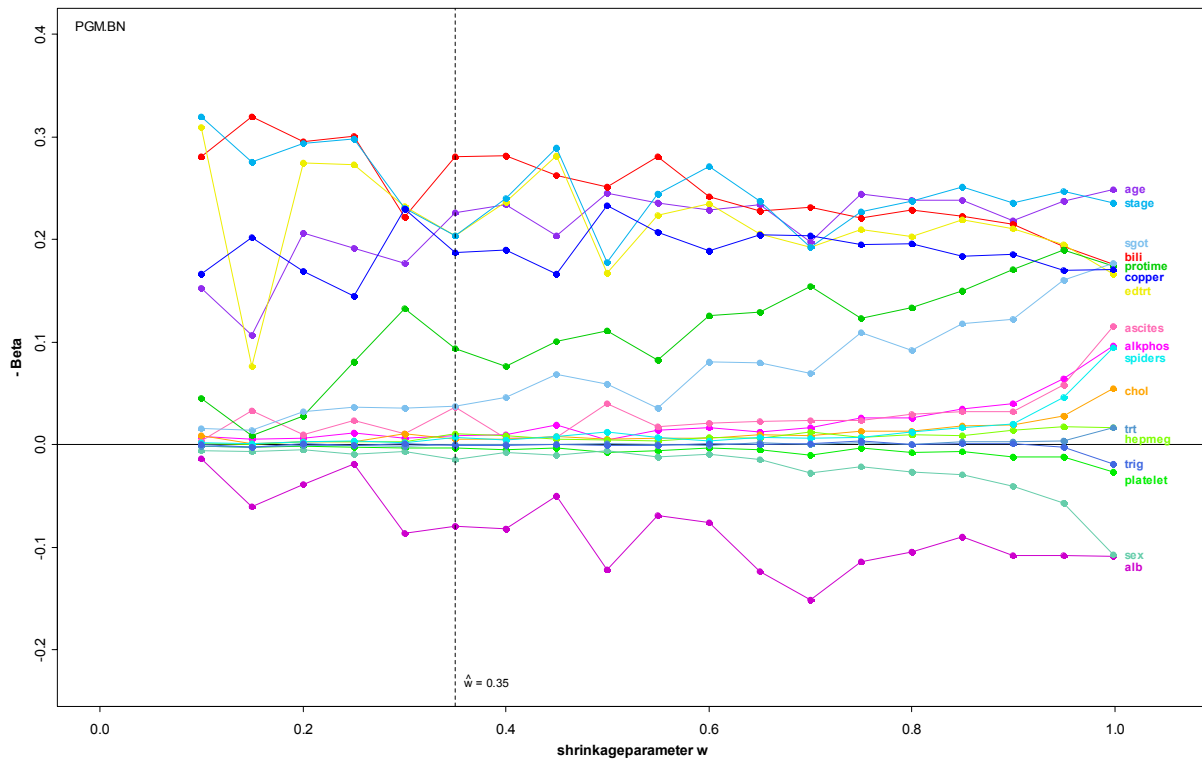


Figure S.12.12: Posterior mean coefficient estimates from the Bayesian NMIG in the AFT model with PGM error as a function of the complexity parameter ω . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the complexity parameter.

S.12.3. Paths of the Bayesian NMIG indicator (linear predictor)

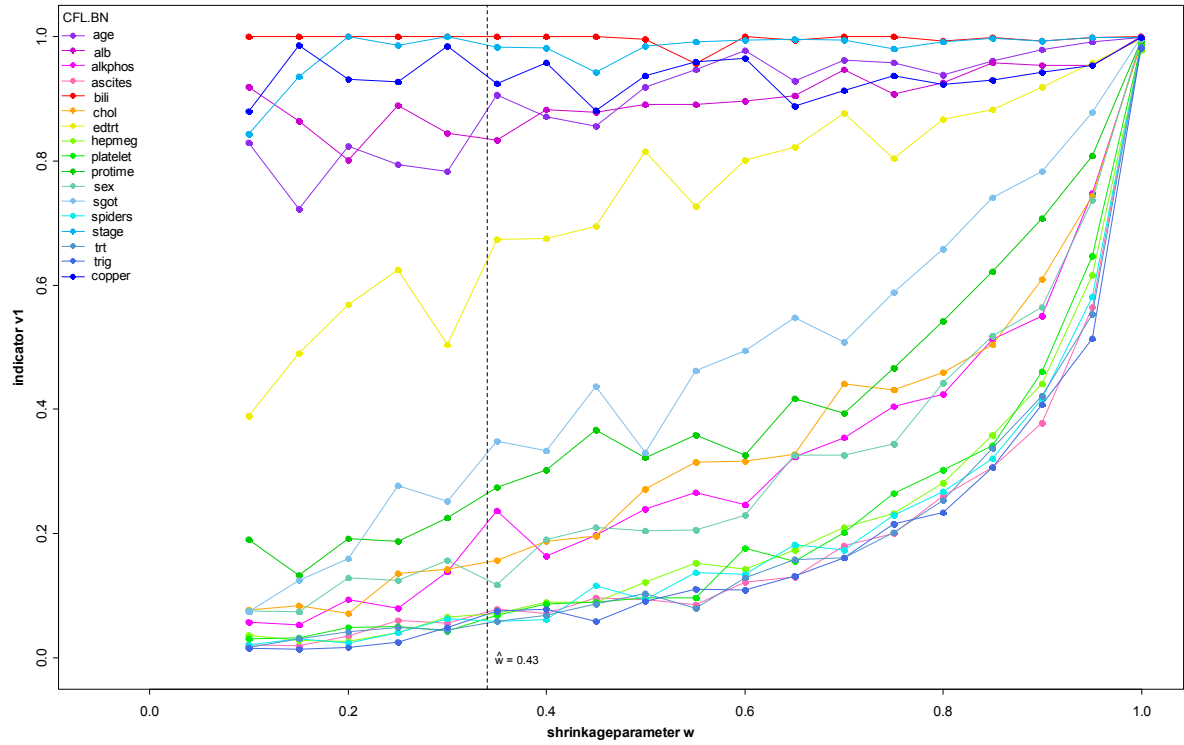


Figure S.12.13: Posterior relative frequencies of the Bayesian NMIG indicator variables in the Cox model based on the full likelihood as a function of the complexity parameter ω . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the complexity parameter.

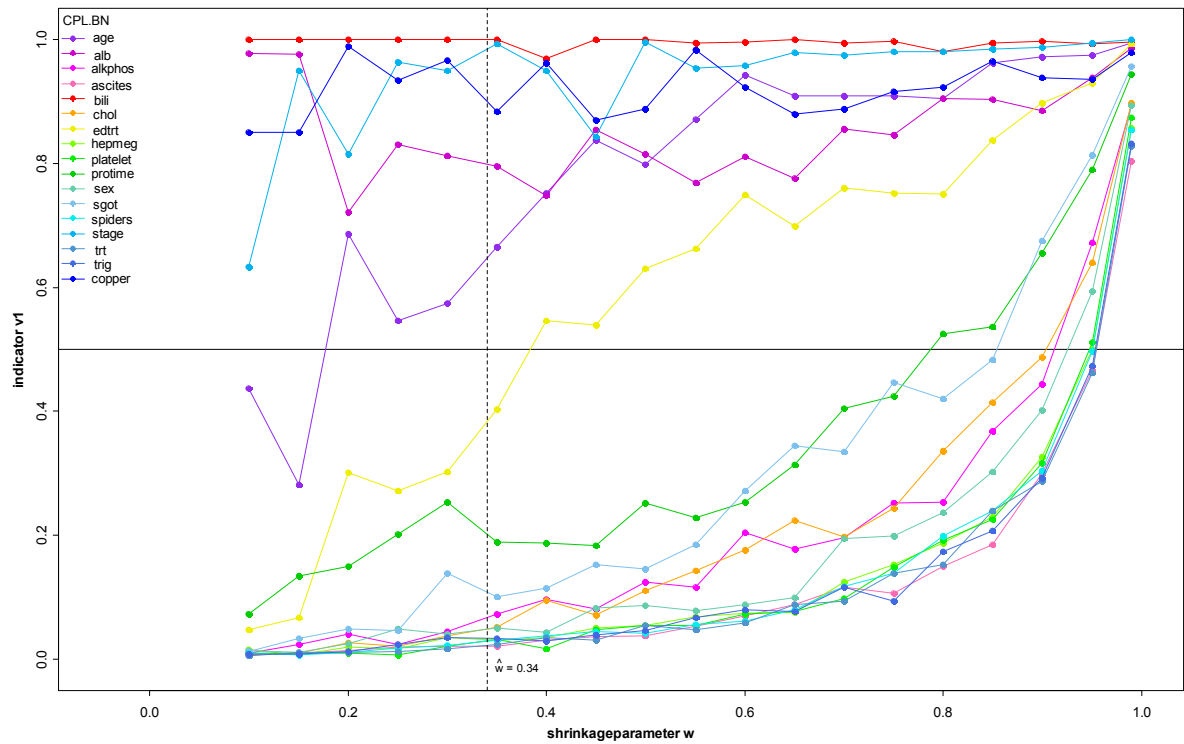


Figure S.12.14: Posterior relative frequencies of the Bayesian NMIG indicator variables in the Cox model based on the partial likelihood as a function of the complexity parameter ω . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the constraint parameter.

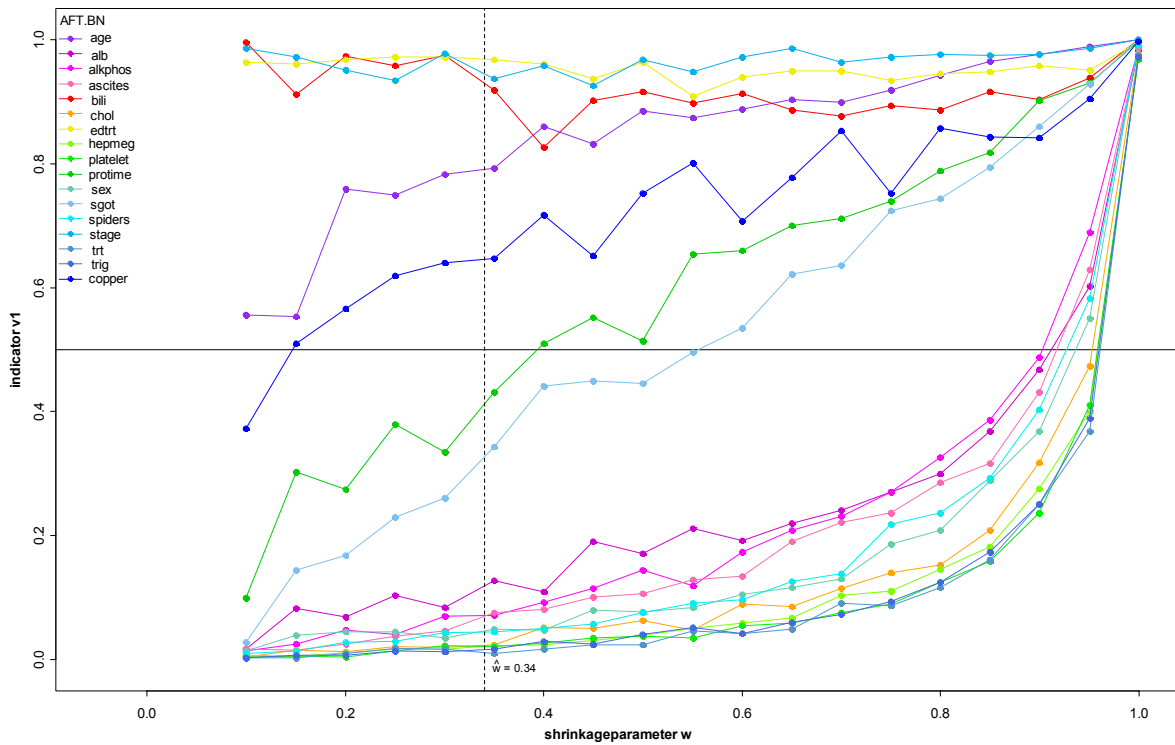


Figure S.12.15: Posterior relative frequencies of the Bayesian NMIG indicator variables in the AFT model with Gaussian error as a function of the complexity parameter ω . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the constraint parameter.

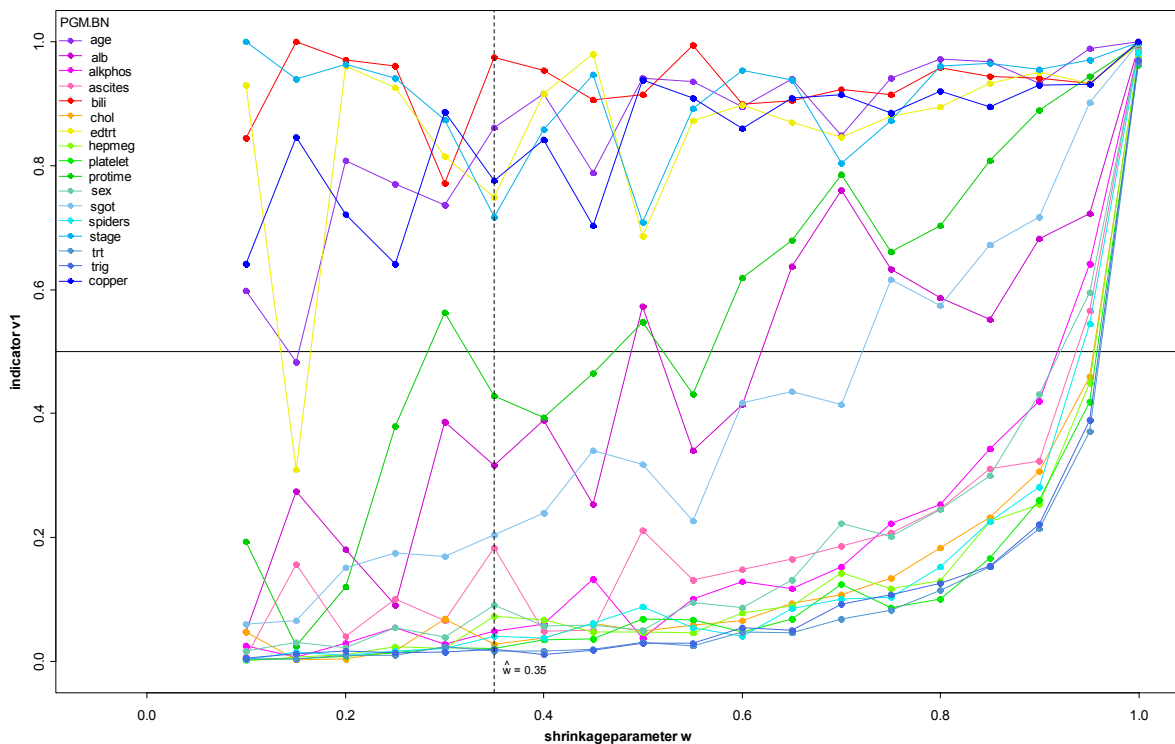


Figure S.12.16: Posterior relative frequencies of the Bayesian NMIG indicator variables in the AFT model with PGM error as a function of the complexity parameter ω . The vertical dotted line marks the corresponding coefficient estimates at the Bayesian estimate of the constraint parameter.

S.12.4. Spline results (nonlinear predictor)

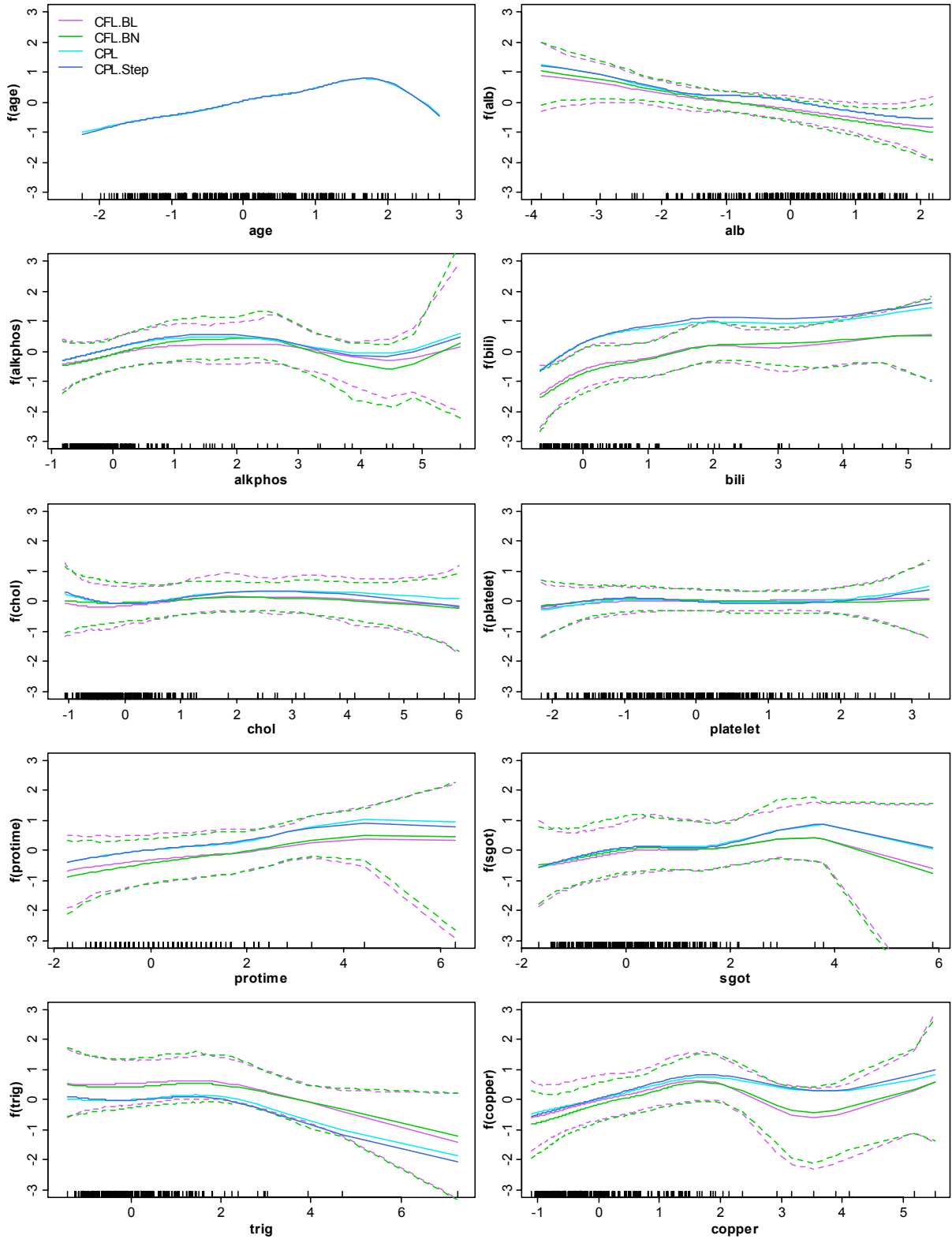


Figure S.12.17: Estimation of the nonlinear covariate effects when all continuous covariates are modeled as P-splines in the CRR model. The figures display the posterior mean estimates of the nonlinear effect (solid lines) with 95% pointwise credible bands (dashed lines) for the Bayesian lasso and Bayesian NMIG under P-spline based hazard function together with the corresponding estimates from the frequentist CRR model and the associated result with the stepwise selection.

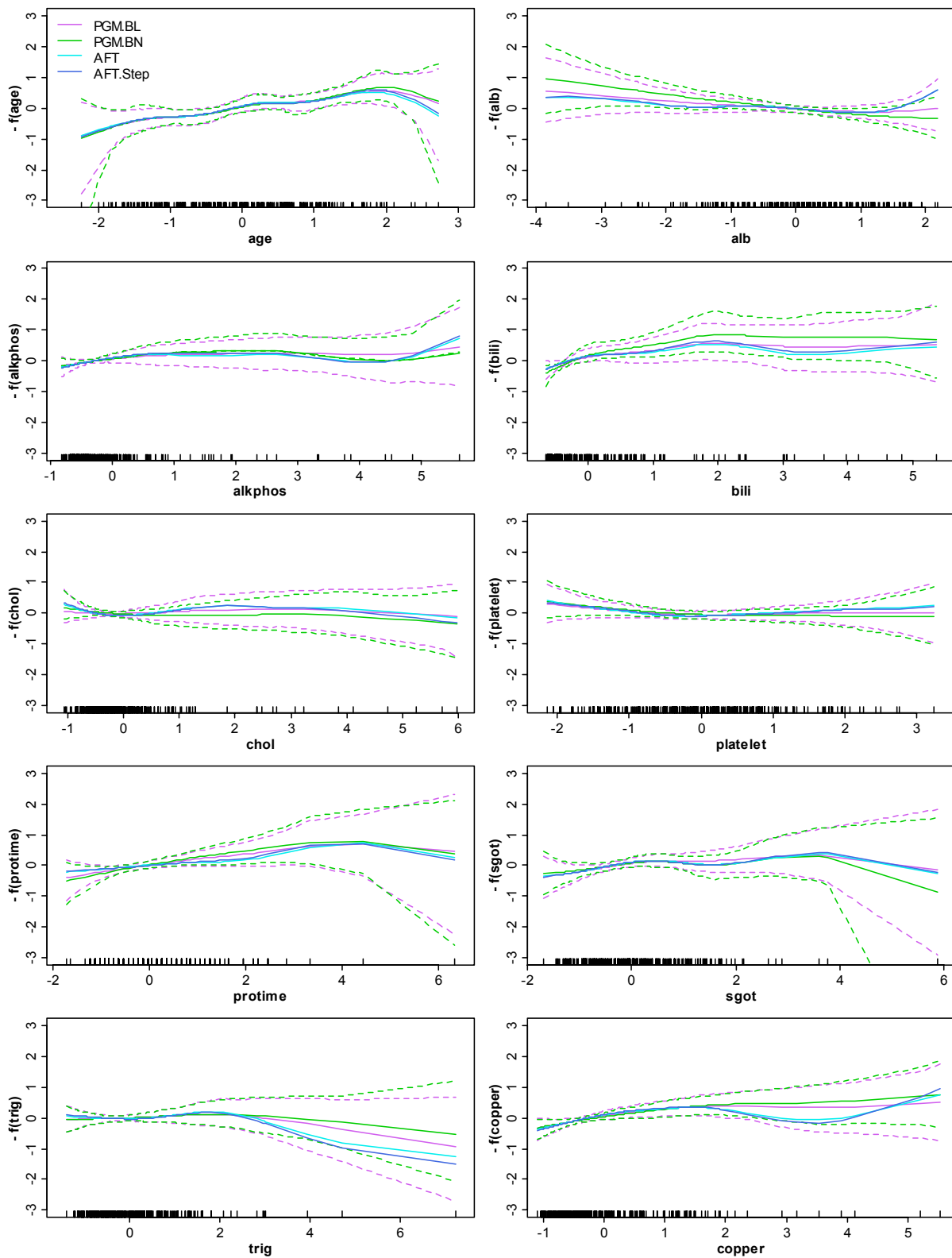


Figure S.12.18: Estimation of the nonlinear covariate effects when all continuous covariates are modeled as P-splines in the AFT model. The figures display the posterior mean estimates of the nonlinear effect (solid lines) with 95% pointwise credible bands (dashed lines) for the Bayesian lasso and Bayesian NMIG together with the corresponding estimates from the frequentist AFT model with Gaussian error and the associated result with the stepwise selection.

S.14. Application: Cytogenetically normal acute myeloid leukemia

Provided are extended results to the “Cytogenetically normal acute myeloid leukemia” data.

S.14.1. Spline results in the data with 50 preselected probe sets

Nonlinear effects in the AFT and CRR model

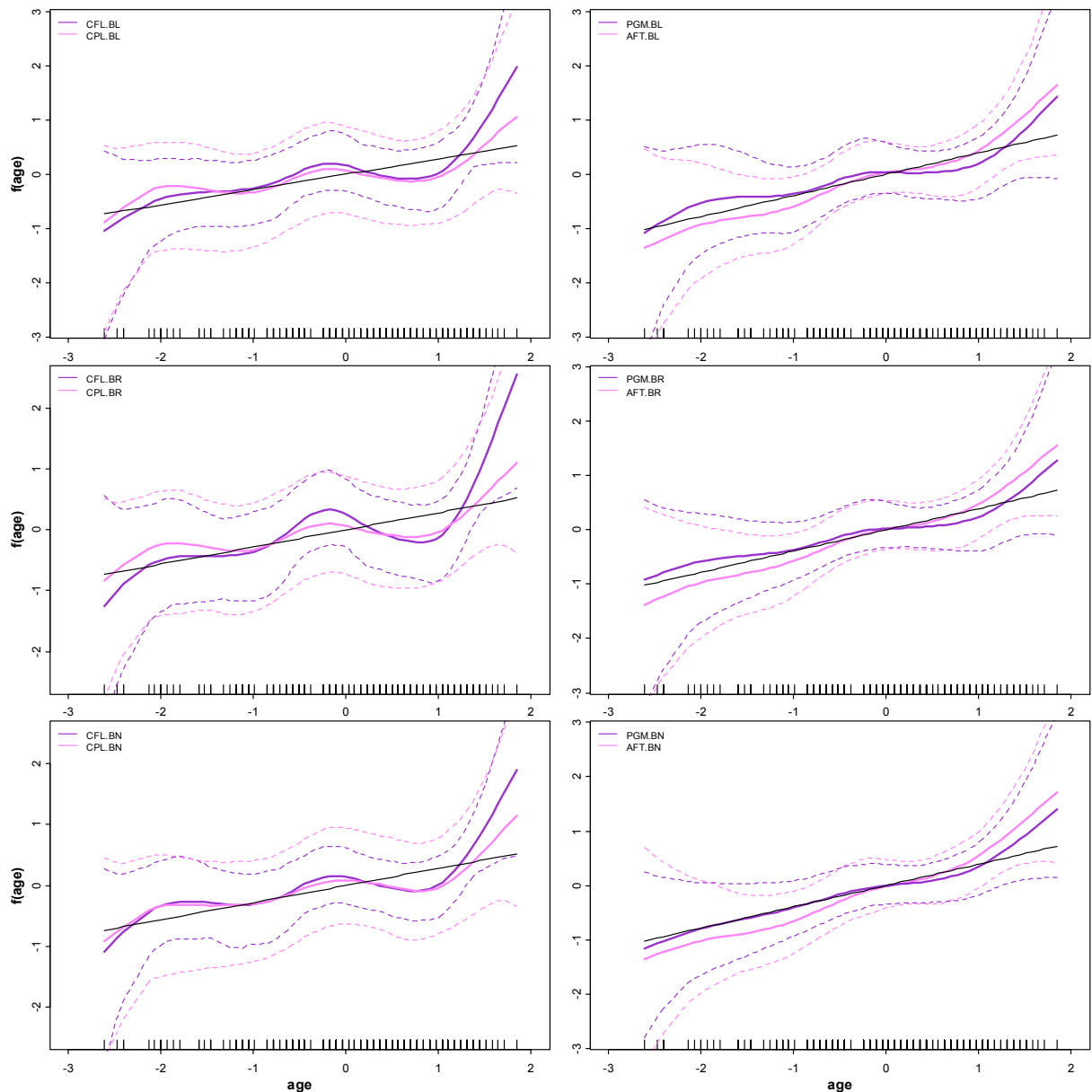


Figure S.14.1: Estimation of the nonlinear *age* effect the CRR model (left side) and the AFT model (right side) using 50 preselected probe sets with lasso (upper panel), ridge (middle panel) and NMIG (lower panel) regularization. Left side: Estimations from the frequentist CRR model based on the full and partial likelihood. Right side: Estimations from the AFT model with Gaussian and PGM error. For the Bayesian models the solid lines show the posterior mean estimates and the dotted lines mark the corresponding 95 % pointwise credible bands. The black stripes at the x-axis mark the observed values.

Selected regression coefficients with nonlinear modeling of the age

The following figure corresponds to Figure 12.1 in the Dissertation.

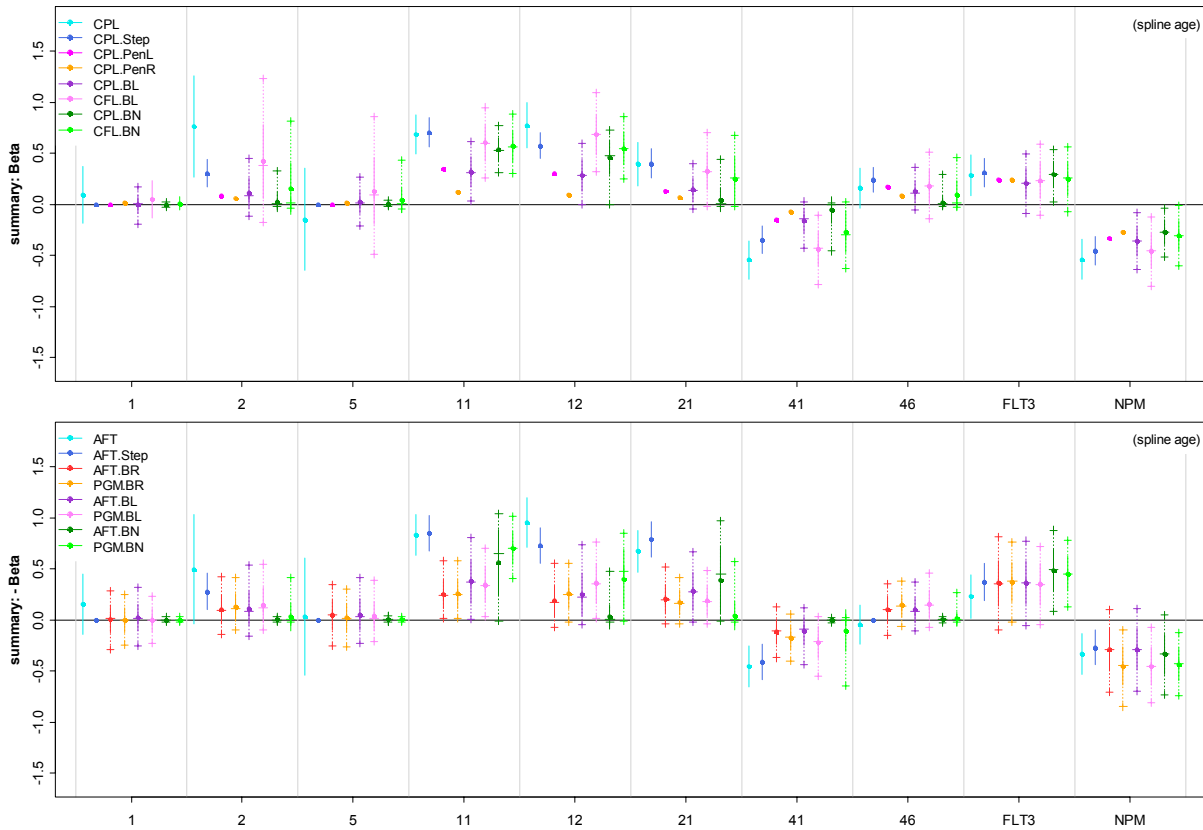
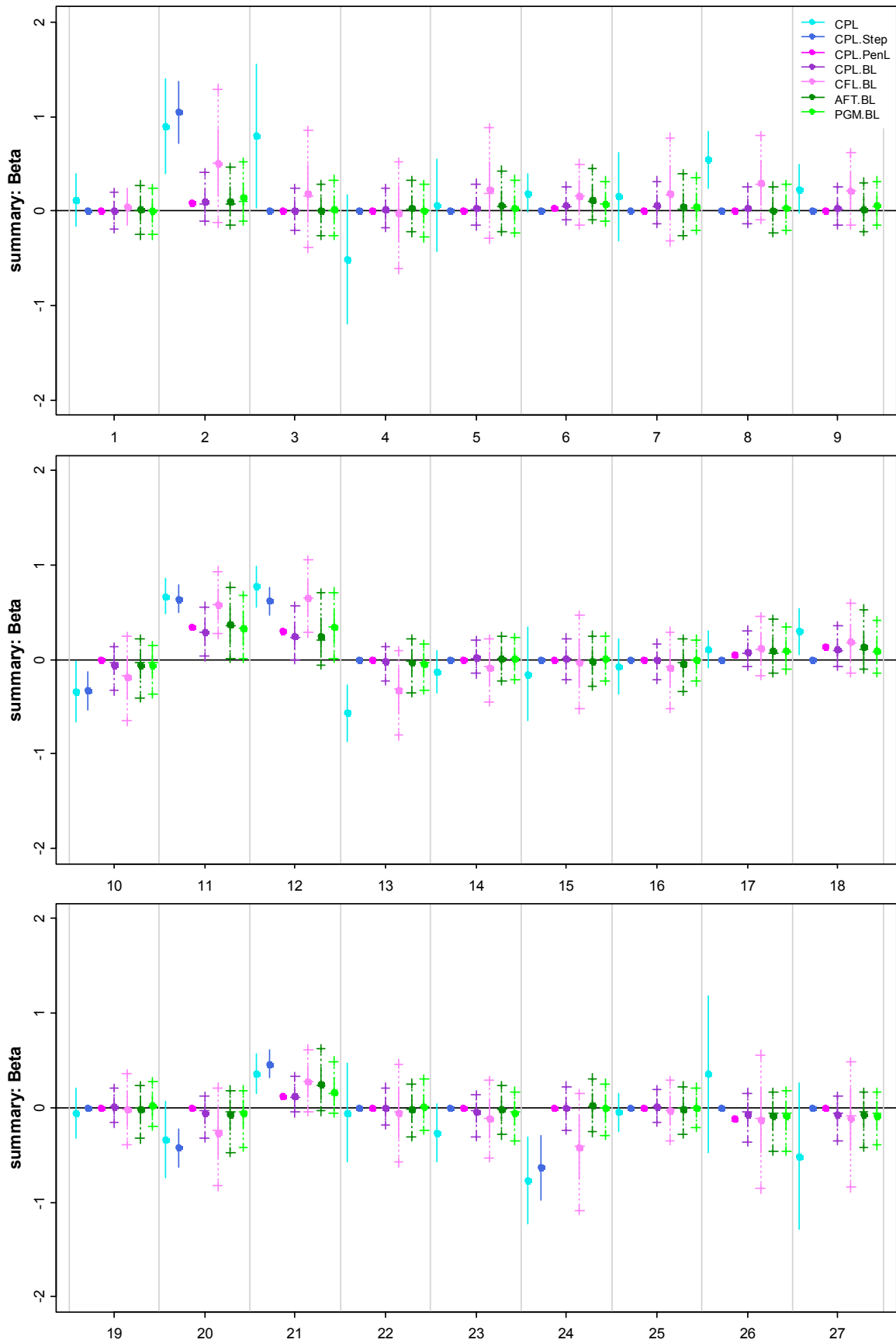


Figure S.14.2: Selected estimated coefficients in the CRR model (upper panel) and AFT model (lower panel) with nonlinear effect of the pheno covariate *age* using 50 preselected probe sets. The probe sets are sorted according to the rank of the Cox scores that are displayed at the x-axis. The points mark the estimate of the regression coefficient and the lines display the corresponding standard errors. For the Bayesian procedures the points mark the mean, the solid lines display the standard errors and the additional dashes mark the median and 95 % empirical quantiles of the marginal posterior distribution of the regression coefficients.

S.14.2. Regression coefficients in the data with 50 preselected probe sets

Estimated regression coefficients under the lasso, ridge and NMIG penalty compared with the frequentist estimates and the stepwise selection.

Regression coefficients under the lasso penalty

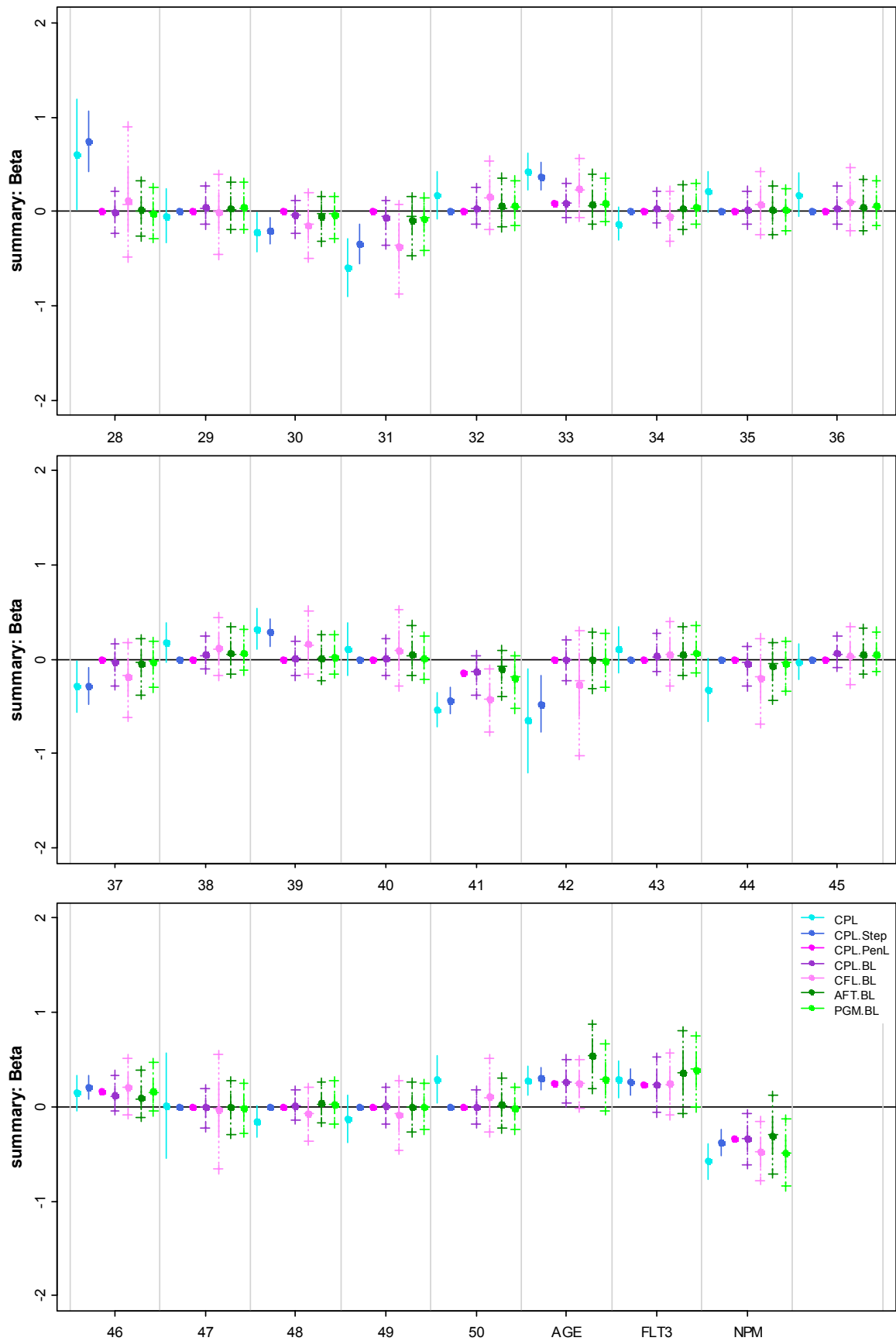
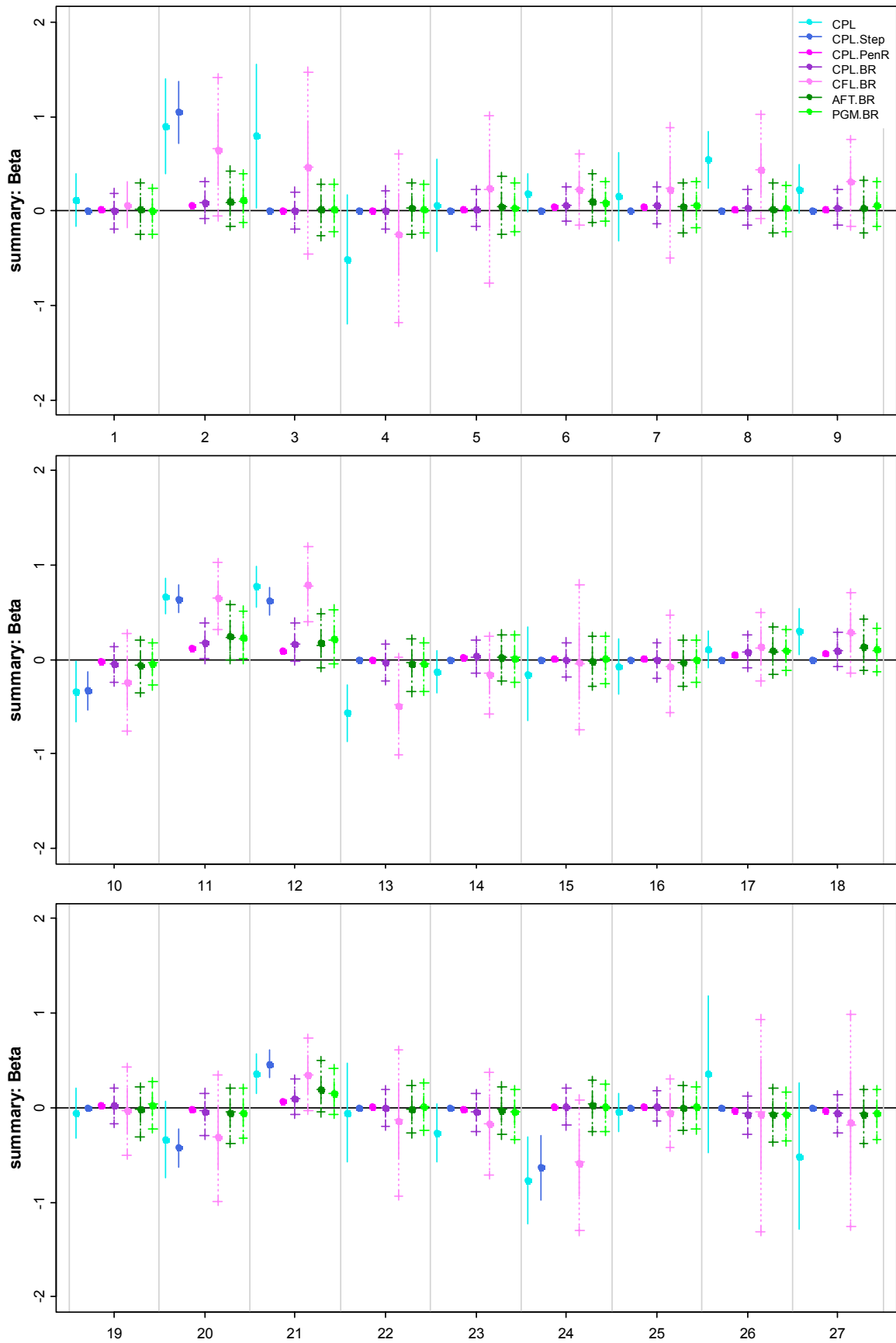


Figure S.14.3: Comparison of the frequentist and Bayesian lasso estimates in the CRR and AFT model with 50 preselected probe sets and linear effect of the pheno covariate *age*.

Regression coefficients under the ridge penalty

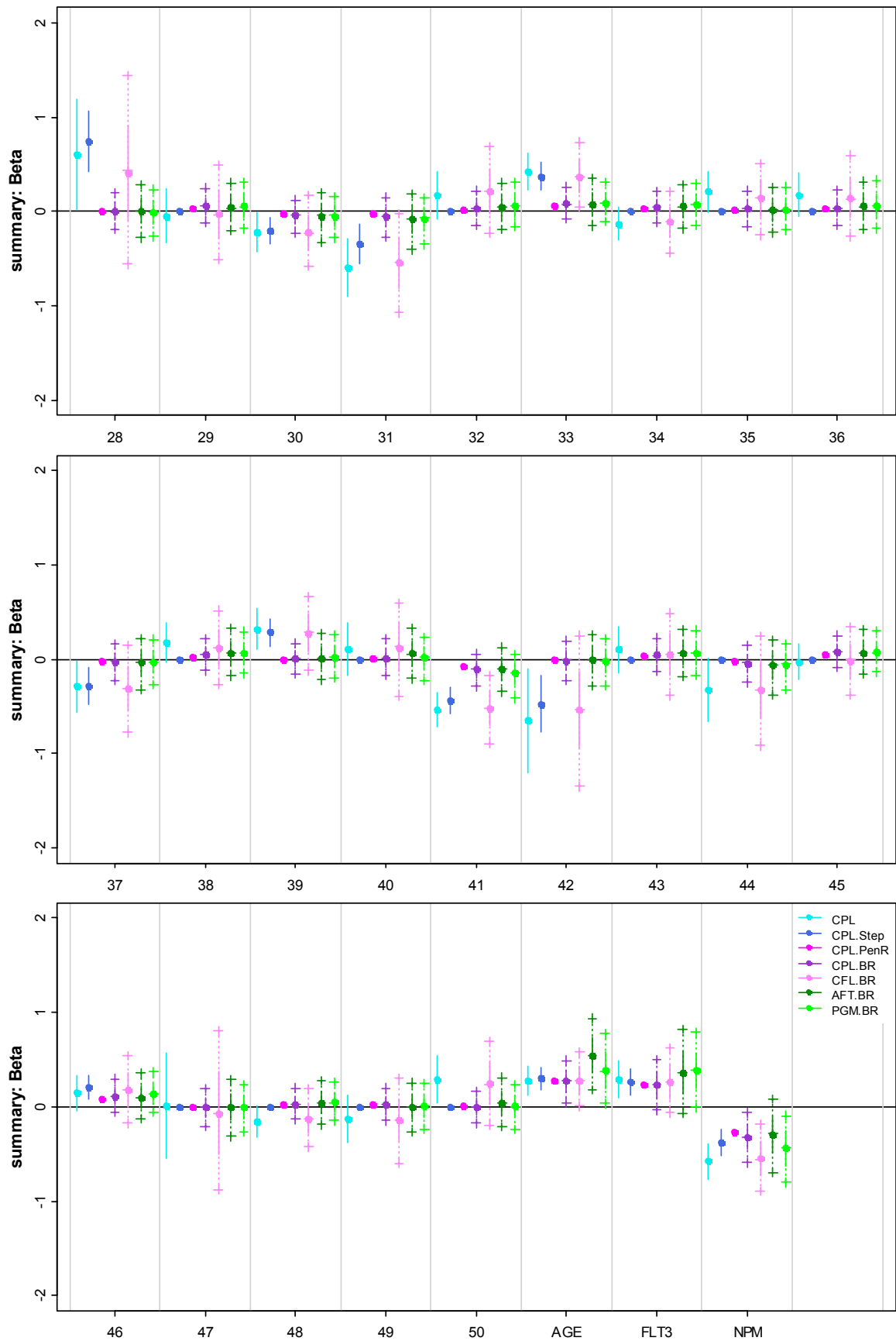
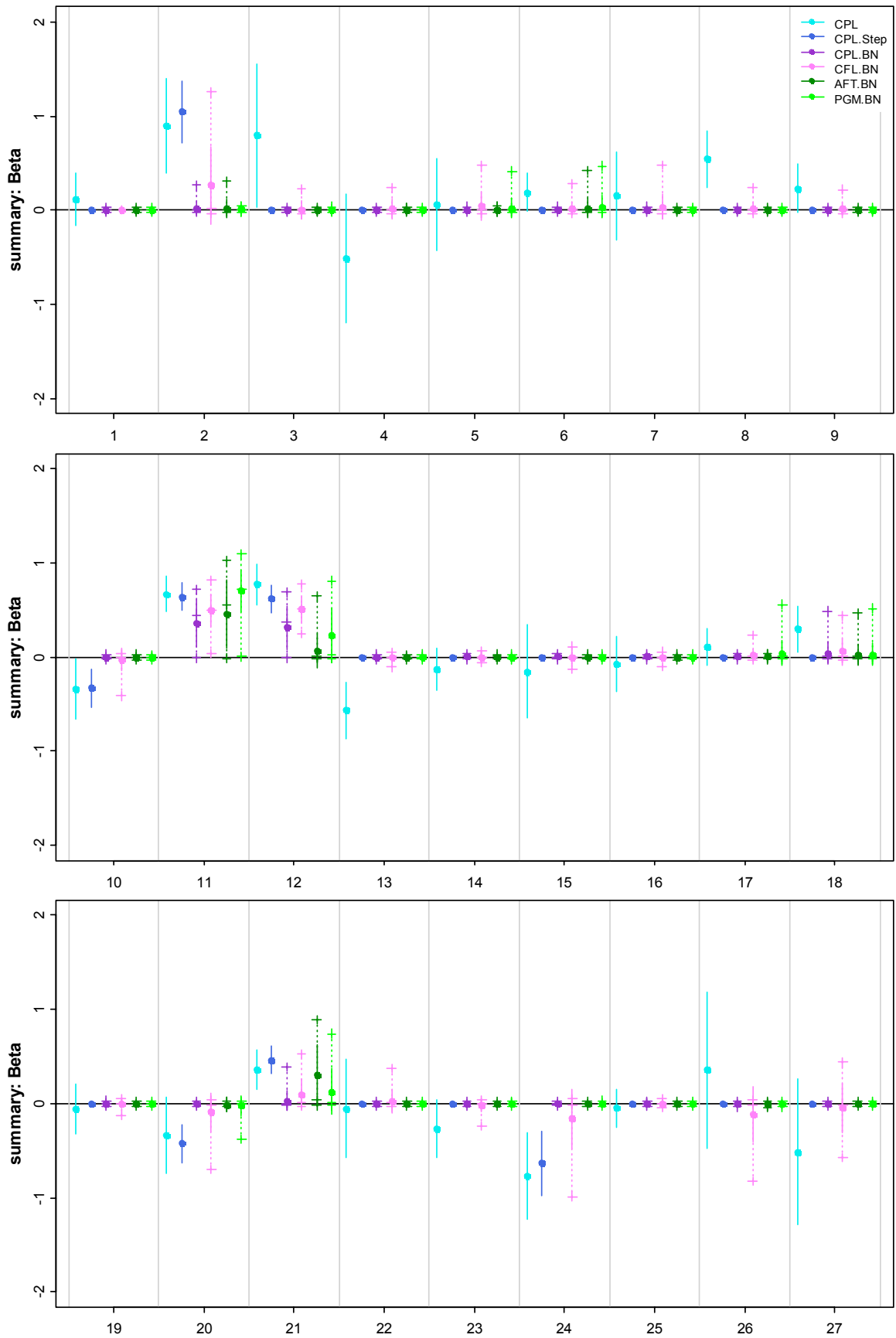


Figure S.14.4: Comparison of the Bayesian ridge estimates in the CRR and AFT model with 50 preselected probe sets and linear effect of the pheno covariate *age*.

Regression coefficients under the NMIG penalty

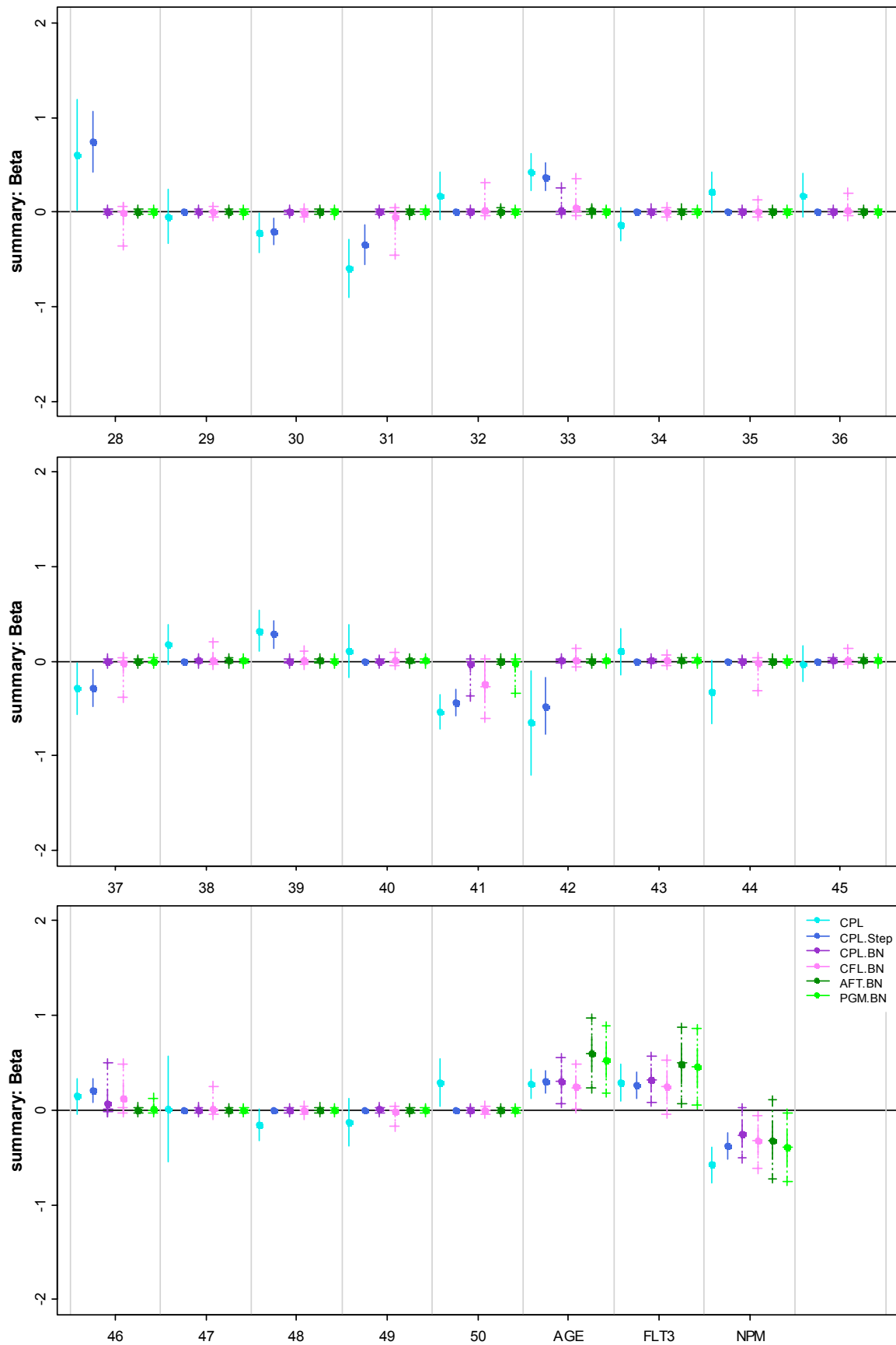
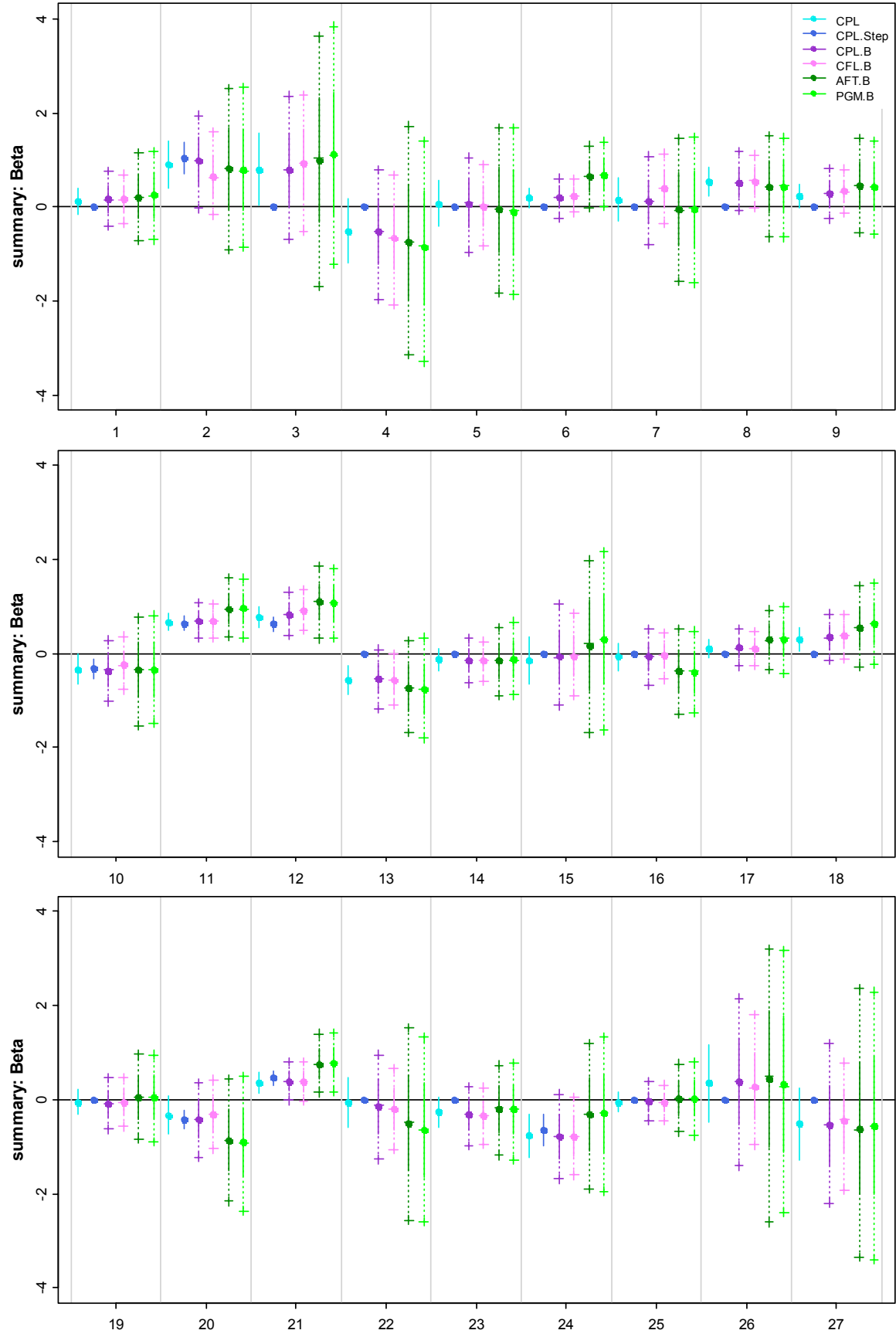


Figure S.14.5: Comparison of the Bayesian NMIG estimates in the CRR and AFT model with 50 preselected probe sets and linear effect of the pheno covariate *age*.

Regression coefficients unregularized



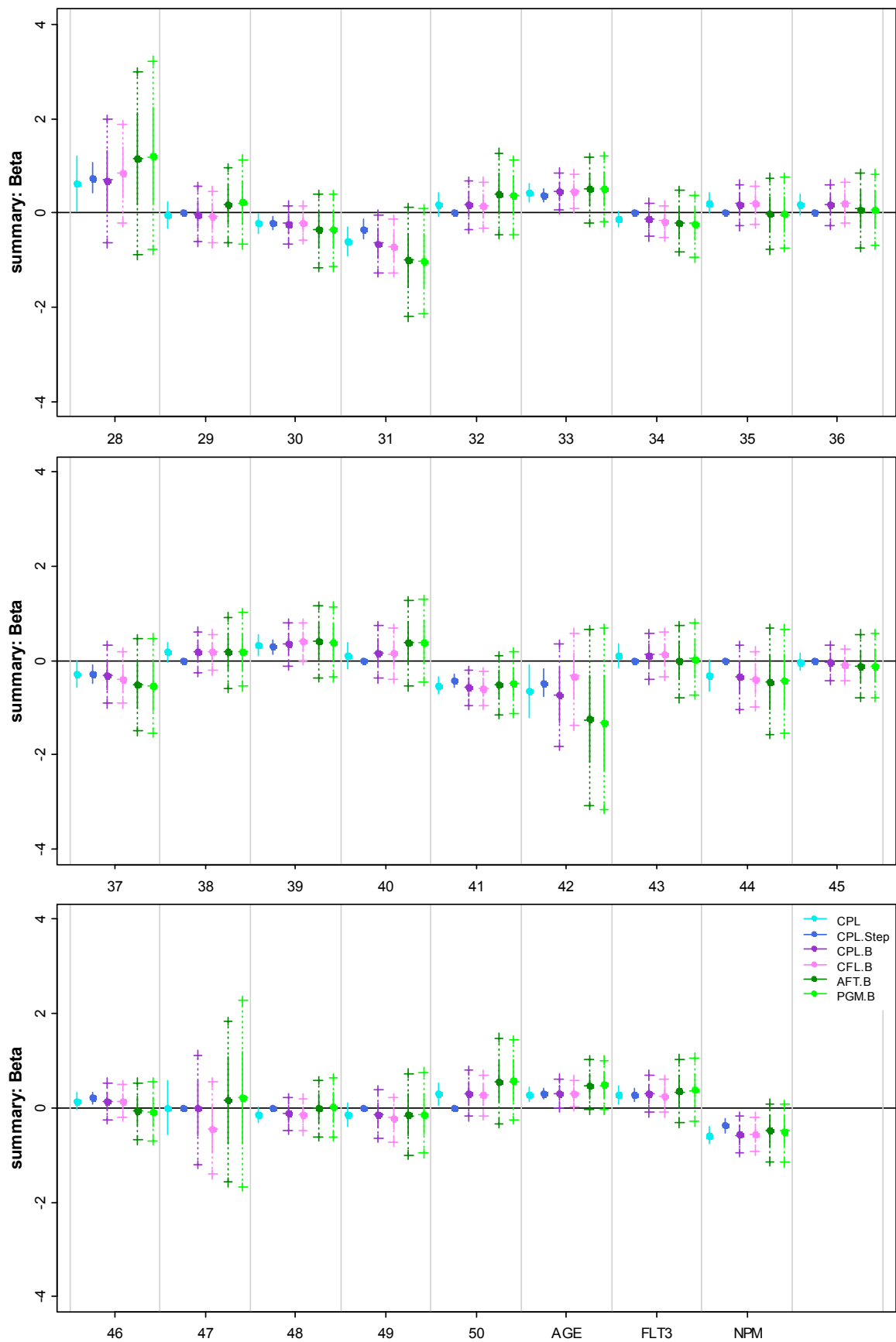


Figure S.14.6: Comparison of the Bayesian unpenalized estimates in the CRR and AFT model with 50 preselected probe sets linear effect of the pheno covariate *age*.

S.14.3. Bayesian NMIG indicators with 50 preselected genes and nonlinear age

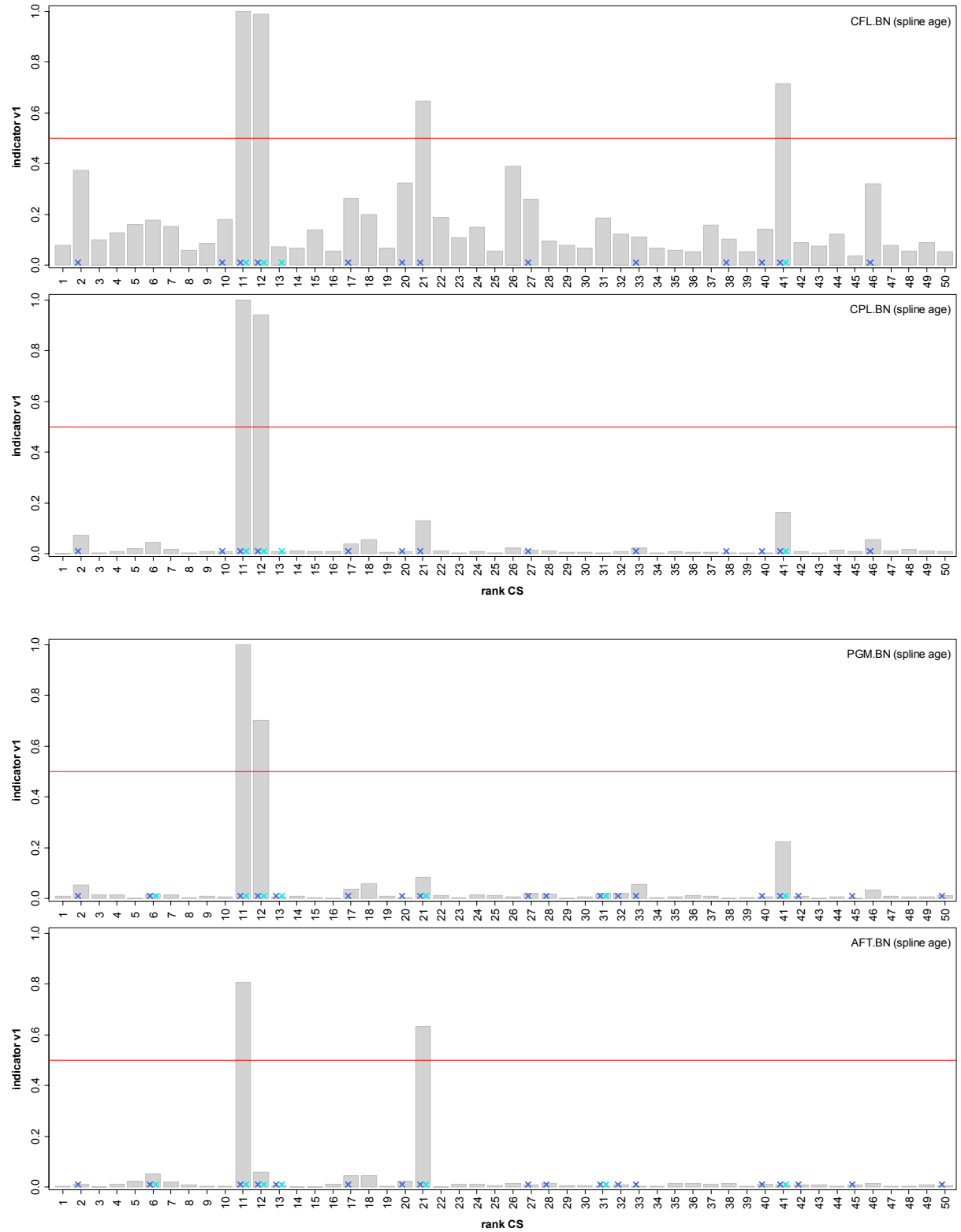


Figure S.14.7: Estimated inclusion probabilities based on posterior relative frequencies of the Bayesian NMIG indicator variable value $I_j = v_1$ in the models with nonlinear age effect using 50 probe sets. First and second row: CRR model based on the full and partial likelihood. Third and fourth row: AFT model with PGM and Gaussian error. The probe sets are sorted according to the rank of the Cox scores that are displayed at the x-axis. The crosses at the bottom of the bars mark the covariates from the corresponding frequentist models, which are significant with respect to the p-value 0.05 (cyan) and which are selected by the stepwise selection (dark blue).

S.14.4. IBS Tables

$$\eta_i = \gamma_0 + \gamma_1 \text{FLT3}_i + \gamma_2 \text{NPM1}_i + \gamma_3 \text{age}_i + \sum_{j=1}^{p_x} \beta_j \text{probeset}_{i,j} \quad (\text{S.14.1})$$

$$\eta_i = \gamma_0 + \gamma_1 \text{FLT3}_i + \gamma_2 \text{NPM1}_i + f_1(\text{age}_i) + \sum_{j=1}^{p_x} \beta_j \text{probeset}_{i,j}, \quad (\text{S.14.2})$$

$$\eta_i = \gamma_0 + \sum_{j=1}^{p_x} \beta_j \text{probeset}_{i,j}, \quad (\text{S.14.3})$$

$$\eta_i = \gamma_0 + \gamma_1 \text{FLT3}_i + \gamma_2 \text{NPM1}_i + \sum_{j=1}^{p_x} \beta_j \text{probeset}_{i,j} \quad (\text{S.14.4})$$

Using the whole set of 44754 probe sets for inference with the frequentist lasso we achieve the following IBSs in the trainings and test data:

$$(\text{S.14.1}) \quad \text{IBS}(\text{train}): 0.138, \quad \text{IBS}(\text{test}): 0.182$$

$$(\text{S.14.3}) \quad \text{IBS}(\text{train}): 0.150, \quad \text{IBS}(\text{test}): 0.195$$

$$(\text{S.14.4}) \quad \text{IBS}(\text{train}): 0.127, \quad \text{IBS}(\text{test}): 0.190$$

The 15 selected probe sets selected with the frequentist lasso when the predictor contains the available probe sets together with the unpenalized covariates FLT3, NPM1 and age have the ranks: 2, 11, 12, 21, 68, 69, 105, 188, 339, 341, 468, 669, 717, 1384, 5423.

CRR model with 50 probe sets and predictor (S.14.1) and (S.14.2)

CRR - 50 probe sets	# Variable	IBS train	IBS test	Rank Cox score
KM	0	0.2120	0.2055	-
CPL3	0	0.1713	0.1897	-
CPL	50	0.0995	0.2081	1:50
CPL.Step	16	0.1129	0.1952	2,10,11,12,20,21,24,28,30,31,33,37,39,41,42,46
CPL.PenL	11	0.1281	0.1767	2,6,11,12,17,18,21,26,33,41,46
CPL.PenR	50	0.1384	0.1710	1:50
CPL.B	50	0.0989	0.2120	1:50
CPL.BR	50	0.1305	0.1680	1:50
CPL.BL	50	0.1253	0.1701	1:50
CPL.BN	50	0.1352	0.1843	1:50
CPL.BR-HS.STD	6	0.1405	0.1726	11,12,18,21,41,46
CPL.BR-HS.CI95	1	0.1648	0.1836	11
CPL.BL-HS.STD	5	0.1372	0.1783	11,12,21,41,46
CPL.BL-HS.CI95	1	0.1609	0.1856	11
CPL.BN-HS.IND	2	0.1423	0.1878	11,12
CPL.spA	50	0.0944	0.2166	1:50
CPL.Step.spA	13	0.1194	0.2068	2,10,11,12,17,20,21,27,33,38,40,41,46
CPL.B.spA	50	0.0913	0.2226	1:50
CPL.BR.spA	50	0.1207	0.1693	1:50
CPL.BL.spA	50	0.1159	0.1739	1:50
CPL.BN.spA	50	0.1276	0.2010	1:50
CPL.BR.spA-HS.STD	7	0.1298	0.1766	11,12,17,18,21,41,46
CPL.BR.spA-HS.CI95	1	0.1604	0.1883	11
CPL.BL.spA-HS.STD	5	0.1294	0.1828	11,12,21,41,46
CPL.BL.spA-HS.CI95	1	0.1571	0.1925	11
CPL.BN.spA-HS.IND	2	0.1353	0.2064	11,12
CFL.B	50	0.1007	0.2145	1:50
CFL.BR	50	0.1002	0.1997	1:50
CFL.BL	50	0.1027	0.1876	1:50
CFL.BN	50	0.1179	0.1838	1:50
CFL.BR-HS.STD	19	0.1205	0.2150	2,6,8,9,11,12,13,18,21,24,30,31,33,37,39,41,42,44,50
CFL.BR-HS.CI95	5	0.1353	0.2196	11,12,31,33,41
CFL.BL-HS.STD	13	0.1241	0.2104	2,8,9,11,12,13,18,21,24,31,33,41,46
CFL.BL-HS.CI95	3	0.1342	0.2084	11,12,41
CFL.BN-HS.IND	3	0.1331	0.1953	11,12,41
CFL.B.spA	50	0.0923	0.2229	1:50
CFL.BR.spA	50	0.0933	0.2128	1:50
CFL.BL.spA	50	0.0965	0.1954	1:50
CFL.BN.spA	50	0.1110	0.1928	1:50
CFL.BR.spA-HS.STD	18	0.1230	0.2294	2,6,8,9,11,12,13,17,20,21,31,32,33,39,41,42,46,50
CFL.BR.spA-HS.CI95	5	0.1483	0.2542	11,12,13,21,41
CFL.BL.spA-HS.STD	12	0.1268	0.2134	2,6,8,9,11,12,13,21,31,33,41,46
CFL.BL.spA-HS.CI95	3	0.1296	0.2089	11,12,41
CFL.BN.spA-HS.IND	4	0.1244	0.2037	11,12,21,41

Table S.14.1: Number of selected features (first column), IBS in the training data (second column), IBS in the test data (third column) and rank of the Cox score of the selected features (fourth column) in the CRR model with predictor (S.14.1) and (S.14.2) (spA=splineAge) with 50 preselected genes.

AFT model with 50 probe sets and predictor (S.14.1) and (S.14.2)

AFT - 50 probe sets	# Variable	IBS train	IBS test	Rank Cox score
KM	0	0.2120	0.2055	-
AFT3	0	0.1790	0.1924	-
AFT	50	0.1115	0.2209	1:50
AFT.Step	17	0.1260	0.1925	2,6,11,12,13,18,20,21,28,30,31,33,37,39,41,42,50
PGM.B(bsr2)	50	0.1547	0.2429	1:50
PGM.B3(bsr2)	0	0.1824	0.1959	-
PGM.B	50	0.1576	0.2453	1:50
PGM.B3	0	0.1796	0.1956	-
PGM.BR	50	0.1471	0.1853	1:50
PGM.BL	50	0.1405	0.1870	1:50
PGM.BN	50	0.1548	0.1986	1:50
PGM.BR-HS.STD	5	0.1573	0.1835	11,12,21,41,46
PGM.BR-HS.CRI	1	0.1765	0.1895	11
PGM.BL-HS.STD	5	0.1482	0.1872	11,12,21,41,46
PGM.BL-HS.CRI	2	0.1570	0.1913	11,12
PGM.BN-HS.IND	1	0.1673	0.1971	11
AFT.spA	50	0.1055	0.2251	1:50
AFT.Step.spA	18	0.1167	0.2289	2,6,11,12,13,17,20,21,27,28,31,32,33,40,41,42,45,50
PGM.BR.spA	50	0.1428	0.1871	1:50
PGM.BL.spA	50	0.1394	0.1897	1:50
PGM.BN.spA	50	0.1464	0.1991	1:50
PGM.BR.spA-HS.STD	5	0.1534	0.1856	11,12,21,41,46
PGM.BR.spA-HS.CRI	1	0.1762	0.1916	11
PGM.BL.spA-HS.STD	5	0.1485	0.1902	11,12,21,41,46
PGM.BL.spA-HS.CRI	2	0.1583	0.1945	11,12
PGM.BN.spA-HS.IND	2	0.1505	0.2000	11,12

Table S.14.2: Number of selected features (first column), IBS in the training data (second column), IBS in the test data (third column) and rank of the Cox score of the selected features (fourth column) in the AFT model with predictor (S.14.1) and (S.14.2) (spA=splineAge) with 50 preselected genes.

CRR model with 50 probe sets and predictor (S.14.3)

CRR - 50 probe sets	# Variable	IBS train	IBS test	Rank Cox score
KM	0	0.2120	0.2055	-
CPL	50	0.1099	0.2248	1:50
CPL.Step	15	0.1214	0.2118	1,2,6,11,12,17,20,21,24,28,31,33,37,41,42
CPL.PenL	13	0.1471	0.1941	2,5,6,11,12,17,18,21,22,33,41,46,48
CPL.PenR	50	0.1579	0.1837	1:50
CPL.B	50	0.1087	0.2304	1:50
CPL.BR	50	0.1493	0.1806	1:50
CPL.BL	50	0.1430	0.1819	1:50
CPL.BN	50	0.1485	0.2038	1:50
CPL.BR-HS.STD	6	0.1678	0.1923	11,12,17,21,41,46
CPL.BR-HS.CI95	2	0.1838	0.2019	11,12
CPL.BL-HS.STD	5	0.1612	0.1947	11,12,17,41,46
CPL.BL-HS.CI95	2	0.1735	0.2040	11,12
CPL.BN-HS.IND	3	0.1566	0.2096	11,12,41
CFL.B	50	0.1080	0.2299	1:50
CFL.BR	50	0.1096	0.2153	1:50
CFL.BL	50	0.1127	0.1992	1:50
CFL.BN	50	0.1326	0.1966	1:50
CFL.BR-HS.STD	18	0.1254	0.2189	1,2,6,8,10,11,12,13,17,20,21,24,28,31,33,37,41,42
CFL.BR-HS.CI95	5	0.1629	0.2534	2,11,12,21,41
CFL.BL-HS.STD	13	0.1251	0.2250	1,2,6,8,11,12,17,20,21,24,31,33,41
CFL.BL-HS.CI95	3	0.1545	0.2264	11,12,41
CFL.BN-HS.IND	3	0.1540	0.2137	11,12,41

Table S.14.3: Number of selected features (first column), IBS in the training data (second column), IBS in the test data (third column) and rank of the Cox score of the selected features (fourth column) in the CRR model with predictor (S.14.3) and 50 preselected genes.

CRR model with 200 probe sets and predictor (S.14.1)

CRR - 200 probe sets	# Variable	IBS train	IBS test	Rank Cox score
KM	0	0.2120	0.2055	-
CPL3	0	0.1713	0.1897	-
CPL.PenL	29	0.0902	0.1858	2,11,12,21,26,30,46,68,69,77,85,96,98,105,114,122,125,130,136,142,145,148,150,151,166,186,188,192,198
CPL.PenR	200	0.1021	0.1599	1:200
CPL.BR	200	0.0820	0.1622	1:200
CPL.BL	200	0.0745	0.1699	1:200
CPL.BN	200	0.1273	0.2063	1:200
CPL.BR-HS.STD	10	0.1204	0.1737	11,12,68,69,85,105,122,130,188,192
CPL.BR-HS.CI95	0	0.1734	0.1845	-
CPL.BL-HS.STD	8	0.1176	0.1786	11,12,68,69,105,122,188,192
CPL.BL-HS.CI95	1	0.1596	0.1850	11
CPL.BN-HS.IND	2	0.1506	0.2185	11,68

Table S.14.4 Number of selected features (first column), IBS in the training data (second column), IBS in the test data (third column) and rank of the Cox score of the selected features (fourth column) in the CRR model with predictor (S.14.1) and 200 preselected genes.

AFT model with 200 probe sets and predictor (S.14.1)

CRR - 200 probe sets	# Variable	IBS.train	IBS.test	Rank Cox score
KM	0	0.2120	0.2055	-
AFT3	0	0.1781	0.1921	-
PGM.B3(bsr2)	0	0.1824	0.1959	-
PGM.BR	200	0.0982	0.2101	1:200
PGM.BL	200	0.1010	0.2088	1:200
PGM.BN	200	0.1536	0.2156	1:200
PGM.BR-HS.STD	12	0.1306	0.1956	11,12,21,54,68,69,85,122,130,162,188,192
PGM.BR-HS.CRI	0	0.2050	0.1964	-
PGM.BL-HS.STD	7	0.1418	0.1888	11,12,68,69,105,122,192
PGM.BL-HS.CRI	0	0.1990	0.1919	-
PGM.BN-HS.IND	2	0.1706	0.2132	2,68

Table S.14.5: Number of selected features (first column), IBS in the training data (second column), IBS in the test data (third column) and rank of the Cox score of the selected features (fourth column) in the AFT model with PGM, predictor (S.14.1) and 200 preselected genes.

Identification of the 50 preselected probe sets

Probe set	Rank Cox score	Cox Score	Probe set	Rank Cox score	Cox Score
X218086at	1	2.657098	X225285at	26	2.119446
X209386at	2	2.629699	X226517at	27	2.109493
X203373at	3	2.577428	X210299sat	28	2.108397
X203372sat	4	2.551171	X238026at	29	2.107287
X201540at	5	2.534832	X222803at	30	2.095810
X211269sat	6	2.377234	X203151at	31	2.091587
X215034sat	7	2.347994	X223095at	32	2.090492
X237311at	8	2.339807	X216264sat	33	2.086782
X232752at	9	2.320357	X235911at	34	2.083917
X218966at	10	2.311515	X224580at	35	2.075535
X229715at	11	2.290252	X235998at	36	2.074752
X211626xat	12	2.275673	X206478at	37	2.074007
X223075sat	13	2.266376	X226028at	38	2.064602
X241708at	14	2.266362	X244764at	39	2.047344
X228011at	15	2.227565	X227328at	40	2.047179
X223503at	16	2.224486	X209760at	41	2.044499
X211597sat	17	2.223346	X214505sat	42	2.041821
X224710at	18	2.175327	X222918at	43	2.039071
X239237at	19	2.172229	X226771at	44	2.038709
X225112at	20	2.172183	X204717sat	45	2.038440
X209856xat	21	2.167402	X213413at	46	2.032464
X235391at	22	2.165048	X210298xat	47	2.030728
X227923at	23	2.155614	X209530at	48	2.021164
X209387sat	24	2.127812	X228345at	49	2.015737
X226485at	25	2.126712	X222116sat	50	2.014193

Table S.14.6: The 50 robe set with highest associated rank (rgCS) of the univariate Cox Score.