Internet Appendix to
“Concentration is All the CAPM Needs”
State-Variable Smoothing and Signal Timing

Adam Upenieks*

June 2026

IA.1 State-Variable Smoothing and Signal Timing

The conditional CAPM tests in the main paper classify trading days into attention states by comparing a five-day rolling median of the attention residual $\widehat{u}_t$ to its trailing one-year quantiles, with the classification lagged by one trading day so that each day's state is determined entirely by information available before the return is earned. This construction involves two implementation choices: the window w of the rolling median applied to the daily residual, and the lag k between the information used to classify a day and the returns measured on that day. Under same-day classification ($k = 0$), day t is assigned to a state using the residual through day t itself; under $k = 1$, the main-paper convention, day t is classified using only information through day $t-1$. This appendix reports the conditional CAPM tests across the grid of these two choices: contemporaneous classification under the main five-day window and under one-day and ten-day alternatives (Tables IA.1–IA.3), and the profile of the Fama–MacBeth estimates across signal lags of one to five days for all three windows (Tables IA.4 and IA.5). Three regularities emerge, and together they explain why the main paper adopts a smoothed, predetermined state variable.

First, under contemporaneous classification the pricing of beta in the firm-specific attention states is not an artifact of any particular smoothing window. Across Tables IA.1, IA.2, and IA.3, the value-weighted Fama–MacBeth slope in the bottom-quartile state is positive and significant at every window: 28.1 basis points ($t = 3.57$) at $w = 5$, 20.4 basis points ($t = 3.81$) at $w = 1$, and 25.2 basis points ($t = 2.70$) at $w = 10$. The per-day magnitude and the number of state days move in opposite directions, and their product is approximately conserved between the one-day and five-day windows, before declining at $w = 10$ as the day count falls to 446 and statistical precision deteriorates. Smoothing therefore does not create the premium; it concentrates a stable total into fewer, more purely classified days. Because the daily residual contains classification noise around the underlying attention regime, marginal days admitted by the unsmoothed flag contribute little

*University of Calgary, Haskayne School of Business, adam.upenieks@ucalgary.ca

premium and dilute the per-day average, and the median filters them out. The monotone decline in the slope from the bottom-quartile state to the top-quartile state appears at every window, for both weighting schemes, and in both the Fama–MacBeth and pooled specifications.

Second, the lag profile in Tables IA.4 and IA.5 decomposes the contemporaneous result into two components with different economic content, and shows that the genuine premium dissipates at horizons beyond roughly five days. For the unsmoothed daily state variable ($w = 1$), the bottom-quartile value-weighted slope is 20.4 basis points contemporaneously, collapses to 6.2 basis points ($t = 1.11$) at $k = 1$, recovers to 21.0 basis points ($t = 2.93$) at $k = 2$, and then decays through 16.8 and 12.5 basis points at $k = 3$ and $k = 5$. A premium that were purely contemporaneous would decay monotonically; the dip-and-recovery shape instead indicates that the same-day slope combines a persistent regime premium, visible at horizons of two to five days, with a contemporaneous-selection component that reverses at the one-day horizon. The selection component arises because the day-t residual co-moves with the day-t market return, so that an unsmoothed same-day classifier partially sorts days on their own realized returns; the subsequent one-day reversal of that component, consistent with the short-horizon reversal evidence of Jegadeesh (1990) and Lehmann (1990), temporarily offsets the regime premium at $k = 1$. The smoothed state variable shows no such dip: with $w = 5$, the bottom-quartile slope is 25.6 basis points ($t = 3.06$) at $k = 1$ and 24.5 basis points ($t = 3.41$) at $k = 2$, because state days belong to multi-day episodes rather than to single extreme signal days, and the reversal of any individual day is diluted within the episode. By $k = 3$ the five-day-median slope has fallen to 14.0 basis points ($t = 1.84$), and by $k = 5$ it is 10.2 basis points ($t = 1.35$), statistically indistinguishable from zero. The ten-day window decays fastest per unit of lag, from 21.8 basis points ($t = 2.51$) at $k = 1$ and 18.4 basis points ($t = 1.98$) at $k = 2$ to 7.9 and 7.2 basis points at $k = 3$ and $k = 5$, both insignificant. The three windows line up on a single information-age scale, $k + (w - 1)/2$, the average staleness of the information entering the classification: the bottom-quartile premium is significant at information ages up to roughly six trading days and statistically zero at ages of seven or more, a threshold the grid reaches at $k = 5$ for the five-day window and at $k = 3$ for the ten-day window; for the unsmoothed variable the corresponding lag lies beyond the tabulated range, and untabulated results at $k = 7$ confirm a slope of 1.6 basis points ($t = 0.29$). The pattern is consistent with a persistent but mean-reverting attention regime whose pricing content is concentrated within roughly a week of the signal. The single below-median cell that remains significant at a long horizon, 9.6 basis points ($t = 2.41$) at $w = 10$ and $k = 5$, sits against insignificant neighbors on every side and is best read as sampling variation across a grid of this size.

Third, the timing grid separates the robust part of the high-residual-state evidence from its fragile part. Under contemporaneous classification with little smoothing, the top-quartile slope is significantly negative (-15.2 basis points, $t = -2.24$ at $w = 1$ in Table IA.2), suggesting an inverted security market line when attention is diverted from firm-specific news. This inversion does not survive predetermined timing: at every positive lag in Tables IA.4 and IA.5, and under contemporaneous classification at $w = 10$, the top-quartile slope is statistically indistinguishable from zero. The inversion is therefore a property of contemporaneous classification rather than of conditional expected returns. Institutional attention spikes on days with large market moves, so the same-day residual selects such days into the high-residual state, and the negative slope reflects the realized co-movement of high-beta portfolios with those moves rather than a predictably inverted price of risk. The statement supported by predetermined classification is that the security market line is steep in the firm-specific attention states and flat, not inverted, elsewhere.

Two cells of the grid summarize the practical conclusions. Under the most conservative construction available, the raw daily residual lagged one day, the below-median state still carries a value-weighted slope of 8.4 basis points ($t = 2.11$) with an intercept indistinguishable from zero, so the central claim that beta prices the cross-section on roughly half of trading days survives a specification with no smoothing parameter and strictly predetermined information. The main-paper construction, the five-day median lagged one day, delivers the same conclusion with substantially more precision: a bottom-quartile slope of 25.6 basis points ($t = 3.06$), a below-median slope of 12.4 basis points ($t = 2.88$), and intercepts statistically equal to zero. Reporting the full grid here documents that the smoothing window and the signal lag redistribute the result across days and horizons but do not generate it.

References

Jegadeesh, Narasimhan (1990). Evidence of Predictable Behavior of Security Returns. *The Journal of Finance*, 45(3), 881–898.

Lehmann, Bruce N. (1990). Fads, Martingales, and Market Efficiency. *The Quarterly Journal of Economics*, 105(1), 1–28.

Table IA.1: **CAPM tests across attention-state cutoffs: five-day rolling median, contemporaneous classification.** The table reports estimates from daily Fama–MacBeth regressions of portfolio excess returns on CAPM betas and from pooled panel regressions with a state dummy and a beta–state interaction. Day t is assigned to an attention state by comparing the 5-day rolling median of the residual $\widehat{u}$, evaluated through day t, to trailing 252-day quantiles of the daily residual (contemporaneous classification, $k = 0$). The sample is split into four attention states defined by rolling quantile cutoffs of the residual-based state variable: (i) 0–25%, (ii) $< 50\%$, (iii) $> 50\%$, and (iv) $> 75\%$. Within each state, results are reported for value-weighted and equal-weighted beta-sorted portfolios. For the pooled regressions, I estimate $r_{p,t} = \alpha + \beta\,\widehat{\beta}_p + \gamma D_t^{state} + \delta(\widehat{\beta}_p \times D_t^{state}) + \varepsilon_{p,t}$. Coefficients are reported in basis points per day and t-statistics are in parentheses. Fama–MacBeth t-statistics use Newey–West standard errors with five lags on the time series of estimated daily slope coefficients. Pooled regression standard errors are clustered by trading day. This table reports the contemporaneous ($k = 0$) counterpart of the main-paper construction, which uses the five-day rolling median lagged by one trading day.

		Fama–MacBeth			Pooled regression					
State	**Port weights**	Intercept	β	Avg R^2	Intercept	β	D^{state}	$\beta \times D^{state}$	R^2	% days
Panel A: (0–25% state)										
	Value-weighted	-14.04**	28.06***	0.428	2.90	1.55	-3.92	14.53*	0.0015	18.0%
		(-2.25)	(3.57)		(0.91)	(0.46)	(-0.60)	(1.89)		
	Equal-weighted	-7.35	24.81***	0.543	5.32*	-0.57	1.18	12.31*	0.0017	18.0%
		(-1.54)	(3.32)		(1.76)	(-0.18)	(0.19)	(1.67)		
Panel B: (<50% state)										
	Value-weighted	-4.08	14.55***	0.448	6.72	-5.09	-9.68*	18.91***	0.0024	51.5%
		(-1.27)	(3.73)		(1.50)	(-1.14)	(-1.70)	(3.11)		
	Equal-weighted	2.22	9.50***	0.549	6.31	-4.23	-2.39	12.29**	0.0017	51.5%
		(0.88)	(2.61)		(1.46)	(-1.01)	(-0.44)	(2.16)		
Panel C: (>50% state)										
	Value-weighted	7.51*	-5.55	0.451	-0.95	11.17***	6.55	-14.97**	0.0018	46.0%
		(1.86)	(-1.09)		(-0.27)	(2.78)	(1.14)	(-2.45)		
	Equal-weighted	7.46**	-5.03	0.567	5.42*	5.94	-0.05	-9.07	0.0013	46.0%
		(2.33)	(-1.06)		(1.71)	(1.57)	(-0.01)	(-1.58)		
Panel D: (>75% state)										
	Value-weighted	11.06**	-10.31	0.436	0.64	6.94**	5.40	-12.53	0.0009	17.6%
		(2.02)	(-1.28)		(0.21)	(2.09)	(0.65)	(-1.55)		
	Equal-weighted	8.26*	-4.92	0.578	5.93**	2.14	-4.01	-1.20	0.0002	17.6%
		(1.72)	(-0.64)		(2.13)	(0.68)	(-0.50)	(-0.16)		

Table IA.2: **CAPM tests across attention-state cutoffs: unsmoothed daily residual, contemporaneous classification.** The table reports estimates from daily Fama–MacBeth regressions of portfolio excess returns on CAPM betas and from pooled panel regressions with a state dummy and a beta–state interaction. Day t is assigned to an attention state by comparing the 1-day rolling median of the residual $\widehat{u}$, evaluated through day t, to trailing 252-day quantiles of the daily residual (contemporaneous classification, $k = 0$). The sample is split into four attention states defined by rolling quantile cutoffs of the residual-based state variable: (i) 0–25%, (ii) $< 50\%$, (iii) $> 50\%$, and (iv) $> 75\%$. Within each state, results are reported for value-weighted and equal-weighted beta-sorted portfolios. For the pooled regressions, I estimate $r_{p,t} = \alpha + \beta\,\widehat{\beta}_p + \gamma D_t^{state} + \delta(\widehat{\beta}_p \times D_t^{state}) + \varepsilon_{p,t}$. Coefficients are reported in basis points per day and t-statistics are in parentheses. Fama–MacBeth t-statistics use Newey–West standard errors with five lags on the time series of estimated daily slope coefficients. Pooled regression standard errors are clustered by trading day.

		Fama–MacBeth			**Pooled regression**					
State	**Port weights**	Intercept	β	Avg R^2	Intercept	β	D^{state}	$\beta \times D^{state}$	R^2	% days
Panel A: (0–25% state)										
	Value-weighted	-9.65**	20.37***	0.440	2.95	1.84	-4.11	10.30	0.0008	25.1%
		(-2.39)	(3.81)		(0.88)	(0.52)	(-0.67)	(1.49)		
	Equal-weighted	-2.94	14.21***	0.535	4.17	1.51	4.30	1.55	0.0004	25.1%
		(-0.99)	(2.71)		(1.31)	(0.46)	(0.77)	(0.24)		
Panel B: (<50% state)										
	Value-weighted	-4.13	13.84***	0.447	1.88	0.47	-0.33	8.21	0.0013	50.6%
		(-1.22)	(3.44)		(0.43)	(0.10)	(-0.06)	(1.35)		
	Equal-weighted	1.41	9.02**	0.551	2.98	0.37	4.24	3.29	0.0008	50.6%
		(0.54)	(2.36)		(0.70)	(0.09)	(0.79)	(0.58)		
Panel C: (>50% state)										
	Value-weighted	7.35*	-4.40	0.453	3.31	6.34	-2.91	-4.15	0.0009	46.9%
		(1.86)	(-0.92)		(0.95)	(1.58)	(-0.51)	(-0.68)		
	Equal-weighted	8.23***	-4.24	0.565	8.48***	1.83	-6.75	0.04	0.0006	46.9%
		(2.66)	(-0.96)		(2.65)	(0.49)	(-1.25)	(0.01)		
Panel D: (>75% state)										
	Value-weighted	11.65**	-15.16**	0.436	1.52	8.13**	1.03	-14.58**	0.0027	24.5%
		(2.28)	(-2.24)		(0.49)	(2.36)	(0.15)	(-2.01)		
	Equal-weighted	8.44*	-10.41	0.578	7.58***	2.72	-9.52	-3.32	0.0016	24.5%
		(1.93)	(-1.52)		(2.59)	(0.85)	(-1.43)	(-0.49)		

Table IA.3: **CAPM tests across attention-state cutoffs: ten-day rolling median, contemporaneous classification.** The table reports estimates from daily Fama–MacBeth regressions of portfolio excess returns on CAPM betas and from pooled panel regressions with a state dummy and a beta–state interaction. Day t is assigned to an attention state by comparing the 10-day rolling median of the residual $\widehat{u}$, evaluated through day t, to trailing 252-day quantiles of the daily residual (contemporaneous classification, $k = 0$). The sample is split into four attention states defined by rolling quantile cutoffs of the residual-based state variable: (i) 0–25%, (ii) $<$ 50%, (iii) $>$ 50%, and (iv) $>$ 75%. Within each state, results are reported for value-weighted and equal-weighted beta-sorted portfolios. For the pooled regressions, I estimate $r_{p,t} = \alpha + \beta\,\widehat{\beta}_p + \gamma D_t^{state} + \delta(\widehat{\beta}_p \times D_t^{state}) + \varepsilon_{p,t}$. Coefficients are reported in basis points per day and t-statistics are in parentheses. Fama–MacBeth t-statistics use Newey–West standard errors with five lags on the time series of estimated daily slope coefficients. Pooled regression standard errors are clustered by trading day.

		Fama–MacBeth			**Pooled regression**					
State	**Port weights**	Intercept	β	Avg R^2	Intercept	β	D^{state}	$\beta \times D^{state}$	R^2	% days
Panel A: (0–25% state)										
	Value-weighted	-9.35 (-1.20)	25.15*** (2.70)	0.447	2.88 (0.92)	1.88 (0.57)	-3.76 (-0.55)	15.41* (1.90)	0.0015	13.8%
	Equal-weighted	-4.86 (-0.78)	21.58** (2.45)	0.566	6.21** (2.11)	-0.62 (-0.20)	-3.29 (-0.52)	14.92* (1.91)	0.0012	13.8%
Panel B: (<50% state)										
	Value-weighted	-1.18 (-0.37)	9.87** (2.52)	0.452	4.48 (0.99)	-0.75 (-0.17)	-5.30 (-0.93)	10.50* (1.73)	0.0009	50.6%
	Equal-weighted	3.71 (1.54)	5.76 (1.60)	0.550	6.47 (1.49)	-1.76 (-0.42)	-2.51 (-0.47)	7.37 (1.30)	0.0005	50.6%
Panel C: (>50% state)										
	Value-weighted	4.37 (1.11)	-0.31 (-0.06)	0.446	0.75 (0.22)	7.63* (1.90)	2.60 (0.45)	-6.93 (-1.13)	0.0006	46.9%
	Equal-weighted	5.89* (1.95)	-0.83 (-0.18)	0.566	5.16* (1.65)	3.86 (1.03)	0.40 (0.07)	-4.35 (-0.76)	0.0003	46.9%
Panel D: (>75% state)										
	Value-weighted	4.73 (0.60)	4.66 (0.47)	0.418	0.37 (0.13)	5.41* (1.66)	9.25 (1.02)	-5.57 (-0.64)	0.0002	14.9%
	Equal-weighted	7.00 (1.29)	5.34 (0.63)	0.570	4.45 (1.63)	1.81 (0.59)	5.89 (0.67)	0.16 (0.02)	0.0003	14.9%

Table IA.4: **Lag profile of the conditional CAPM: Fama–MacBeth estimates, value-weighted portfolios.**
The table reports time-series averages of daily Fama–MacBeth cross-sectional regressions of beta-decile portfolio excess returns on rolling 252-day portfolio betas, within attention states classified using only information available through day $t-k$, for smoothing windows $w \in \{1,5,10\}$ and signal lags $k \in \{1,2,3,5\}$. Coefficients are in basis points per day; Newey–West t-statistics with five lags are in parentheses. Days is the number of trading days in the state. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

	$w=1$				$w=5$				$w=10$			
Signal lag k	1	2	3	5	1	2	3	5	1	2	3	5
0–25% state												
$\widehat{\lambda}_\beta$	6.20	20.96***	16.76***	12.50**	25.60***	24.45***	13.95*	10.23	21.83**	18.42**	7.90	7.19
	(1.11)	(2.93)	(2.79)	(2.11)	(3.06)	(3.41)	(1.84)	(1.35)	(2.51)	(1.98)	(0.91)	(1.03)
$\widehat{\alpha}$	3.22	-10.68*	-2.39	-1.56	-8.61	-9.63	-1.61	0.16	-8.87	-7.53	-0.67	-3.29
	(0.71)	(-1.66)	(-0.48)	(-0.31)	(-1.30)	(-1.64)	(-0.27)	(0.03)	(-1.28)	(-0.98)	(-0.10)	(-0.53)
Days	810	810	809	807	580	579	578	576	445	444	443	441
<50% state												
$\widehat{\lambda}_\beta$	8.40**	10.40**	12.85***	7.38	12.40***	6.43	5.94	7.57*	8.64**	7.82*	6.26	9.64**
	(2.11)	(2.31)	(3.09)	(1.58)	(2.88)	(1.53)	(1.34)	(1.78)	(2.07)	(1.89)	(1.52)	(2.41)
$\widehat{\alpha}$	-0.56	-2.84	-2.21	-0.44	-2.64	1.05	-0.37	-2.02	-1.04	-1.41	-0.60	-3.28
	(-0.17)	(-0.78)	(-0.66)	(-0.12)	(-0.79)	(0.31)	(-0.11)	(-0.59)	(-0.32)	(-0.44)	(-0.18)	(-1.02)
Days	1631	1630	1629	1627	1659	1658	1657	1655	1629	1628	1627	1625
>50% state												
$\widehat{\lambda}_\beta$	1.61	-0.56	-3.05	2.78	-3.00	3.67	4.36	2.47	1.33	2.27	3.98	0.36
	(0.30)	(-0.12)	(-0.66)	(0.63)	(-0.62)	(0.75)	(0.97)	(0.52)	(0.27)	(0.47)	(0.80)	(0.07)
$\widehat{\alpha}$	3.51	5.94*	5.24	3.31	5.92	1.76	3.32	5.15	4.08	4.36	3.52	6.26
	(0.86)	(1.71)	(1.52)	(0.88)	(1.53)	(0.45)	(0.89)	(1.34)	(1.06)	(1.14)	(0.89)	(1.58)
Days	1510	1510	1510	1510	1482	1482	1482	1482	1511	1511	1511	1511
>75% state												
$\widehat{\lambda}_\beta$	1.79	-2.19	-7.06	-4.78	-2.65	3.29	3.40	4.44	-0.39	-0.27	-2.00	-2.01
	(0.24)	(-0.35)	(-0.96)	(-0.81)	(-0.34)	(0.42)	(0.41)	(0.52)	(-0.04)	(-0.03)	(-0.23)	(-0.25)
$\widehat{\alpha}$	2.88	10.80**	5.62	7.51	9.22	6.57	4.00	4.94	6.34	7.50	5.84	8.06
	(0.47)	(2.28)	(1.13)	(1.49)	(1.59)	(1.01)	(0.54)	(0.66)	(0.78)	(1.07)	(0.80)	(1.18)
Days	788	788	788	788	567	567	567	567	480	480	480	480

Table IA.5: **Lag profile of the conditional CAPM: Fama–MacBeth estimates, equal-weighted portfolios.**
The table reports time-series averages of daily Fama–MacBeth cross-sectional regressions of beta-decile portfolio excess returns on rolling 252-day portfolio betas, within attention states classified using only information available through day $t-k$, for smoothing windows $w \in \{1, 5, 10\}$ and signal lags $k \in \{1, 2, 3, 5\}$. Coefficients are in basis points per day; Newey–West t-statistics with five lags are in parentheses. Days is the number of trading days in the state. ***, **, and * denote significance at the 1%, 5%, and 10% levels.

	$w=1$				$w=5$				$w=10$			
Signal lag k	1	2	3	5	1	2	3	5	1	2	3	5
0–25% state												
$\widehat{\lambda}_\beta$	2.74	17.69***	11.58**	6.63	24.80***	21.48***	10.97	4.69	18.73**	17.35**	8.32	5.65
	(0.54)	(2.81)	(2.06)	(1.28)	(3.21)	(3.23)	(1.54)	(0.66)	(2.24)	(2.04)	(1.01)	(0.86)
$\widehat{\alpha}$	5.98*	-3.84	4.74	4.89	-4.00	-3.22	3.62	5.37	-4.35	-3.59	2.01	-1.10
	(1.82)	(-0.84)	(1.25)	(1.23)	(-0.80)	(-0.71)	(0.78)	(1.21)	(-0.76)	(-0.61)	(0.38)	(-0.23)
Days	810	810	809	807	580	579	578	576	445	444	443	441
<50% state												
$\widehat{\lambda}_\beta$	5.13	5.21	8.37**	3.22	9.01**	3.38	2.56	4.10	4.88	4.41	2.77	5.34
	(1.34)	(1.26)	(2.20)	(0.77)	(2.26)	(0.88)	(0.63)	(1.03)	(1.27)	(1.16)	(0.74)	(1.45)
$\widehat{\alpha}$	2.57	2.85	2.98	3.80	2.20	4.93**	3.66	1.87	3.70	2.54	3.41	1.92
	(1.04)	(1.04)	(1.20)	(1.46)	(0.87)	(2.02)	(1.46)	(0.71)	(1.46)	(1.06)	(1.40)	(0.77)
Days	1631	1630	1629	1627	1659	1658	1657	1655	1629	1628	1627	1625
>50% state												
$\widehat{\lambda}_\beta$	0.12	-0.05	-3.35	2.10	-4.33	1.90	2.92	1.10	0.40	0.80	2.62	-0.15
	(0.02)	(-0.01)	(-0.76)	(0.52)	(-0.96)	(0.42)	(0.70)	(0.25)	(0.09)	(0.18)	(0.56)	(-0.03)
$\widehat{\alpha}$	6.97**	6.70**	6.55**	5.68**	7.46**	4.44	5.85**	7.87***	5.76*	7.04**	6.05**	7.60**
	(2.27)	(2.53)	(2.42)	(1.96)	(2.45)	(1.48)	(2.03)	(2.80)	(1.91)	(2.38)	(1.97)	(2.54)
Days	1510	1510	1510	1510	1482	1482	1482	1482	1511	1511	1511	1511
>75% state												
$\widehat{\lambda}_\beta$	4.08	-1.45	-9.14	-5.29	1.42	2.03	2.24	2.40	-1.31	-0.60	-1.60	-2.12
	(0.57)	(-0.26)	(-1.36)	(-1.03)	(0.19)	(0.28)	(0.30)	(0.33)	(-0.15)	(-0.07)	(-0.23)	(-0.30)
$\widehat{\alpha}$	3.74	11.16***	7.48*	8.72**	9.13*	10.01**	7.20	7.53	9.69*	11.08**	7.73	10.82**
	(0.76)	(3.52)	(1.82)	(2.13)	(1.87)	(2.05)	(1.26)	(1.52)	(1.74)	(2.37)	(1.57)	(2.03)
Days	788	788	788	788	567	567	567	567	480	480	480	480