

# Stock Return Prediction Using Television Advertising Data

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## APPENDIX

### A JPY-BASED FAMA-FRENCH FACTOR CONSTRUCTION AND MONTHLY RETURNS

This section details the construction of JPY-denominated Fama–French three-factor data and reports the resulting monthly factor returns used in the study.

#### Construction Procedure

The USD-denominated Fama–French three-factor data<sup>20</sup> are converted to Japanese yen as follows.

**Currency Conversion.** The gross market return in USD is first recovered from the reported market risk premium:

$$\text{MarketReturn}_{\text{USD},t} = \text{MktRF}_{\text{USD},t} + \text{RF}_{\text{USD},t} \quad \text{Equation 15.}$$

Daily returns in JPY then account for exchange rate movements:

$$\text{MarketReturn}_{\text{JPY},t} = (1 + \text{MarketReturn}_{\text{USD},t}) \times (1 + \text{FX}_t) - 1 \quad \text{Equation 16.}$$

where  $\text{FX}_t$  is the daily USD/JPY return. The SMB and HML factors require only currency conversion:

$$\text{SMB}_{\text{JPY},t} = (1 + \text{SMB}_{\text{USD},t}) \times (1 + \text{FX}_t) - 1, \quad \text{HML}_{\text{JPY},t} = (1 + \text{HML}_{\text{USD},t}) \times (1 + \text{FX}_t) - 1 \quad \text{Equation 17.}$$

**Risk-Free Rate.** The U.S. risk-free rate is replaced with the Japanese government bond (JGB) yield, converted to a daily return:

$$\text{RF}_{\text{JPY},t} = \left(1 + \frac{\text{JGB}_{\text{Annual},t}}{100}\right)^{1/252} - 1 \quad \text{Equation 18.}$$

**Monthly Aggregation.** Daily JPY-based factors are compounded to monthly returns:

$$\text{Factor}_{\text{JPY},m} = \prod_{t \in \text{month } m} (1 + \text{Factor}_{\text{JPY},t}) - 1 \quad \text{Equation 19.}$$

*Monthly Factor Returns*

The resulting monthly factor returns (Mkt-JPY, SMB-JPY, HML-JPY, and the risk-free rate RF-JPY) covering April 2019 to December 2024 are reported below.

Date	Mkt-JPY	SMB-JPY	HML-JPY	RF-JPY	Date	Mkt-JPY	SMB-JPY	HML-JPY	RF-JPY
2019-04	0.00840	0.00026	-0.01836	-0.001744	2022-03	0.03709	0.03751	0.01193	-0.000870
2019-05	-0.06080	-0.01884	-0.04206	-0.001592	2022-04	-0.01719	0.06155	0.12308	-0.001213
2019-06	0.01940	-0.01382	-0.01028	-0.001438	2022-05	-0.00961	-0.02224	-0.01740	-0.001249
2019-07	0.01126	0.02316	-0.01519	-0.001313	2022-06	-0.00655	0.08254	0.10023	-0.001376
2019-08	-0.02933	-0.03715	-0.04193	-0.001314	2022-07	0.03073	-0.01677	-0.07632	-0.001341
2019-09	0.05370	0.00239	0.04465	-0.001655	2022-08	0.01328	0.05635	0.05098	-0.001203
2019-10	0.05764	0.01063	0.03024	-0.003041	2022-09	-0.05305	0.05688	0.06653	-0.001499
2019-11	0.01717	0.02355	-0.01118	-0.002079	2022-10	0.04774	0.01680	-0.00637	-0.001742
2019-12	0.01987	0.00384	0.00573	-0.001335	2022-11	0.03340	-0.06088	-0.06205	-0.001287
2020-01	-0.01941	-0.01475	-0.01649	-0.001227	2022-12	-0.04047	-0.03829	0.01978	-0.001637
2020-02	-0.10094	-0.05910	0.02303	-0.001393	2023-01	0.03603	-0.01845	-0.02904	-0.001578
2020-03	-0.05353	0.00881	-0.04216	-0.002952	2023-02	0.01313	0.05217	0.10226	-0.001699
2020-04	0.03192	0.01210	-0.07992	-0.001594	2023-03	0.01642	-0.02395	-0.05949	-0.002284
2020-05	0.06963	0.03868	-0.06092	-0.001442	2023-04	0.01997	0.00297	0.05204	-0.002071
2020-06	0.00338	0.01219	-0.03435	-0.001349	2023-05	0.04073	-0.01134	0.01121	-0.001738
2020-07	-0.04978	-0.04389	-0.05826	-0.001264	2023-06	0.07790	0.02145	0.07130	-0.001434
2020-08	0.09264	0.02019	0.00908	-0.000862	2023-07	0.00936	-0.02490	0.03447	-0.001111
2020-09	0.01985	0.04829	-0.04230	-0.001263	2023-08	0.00812	0.03250	0.06248	-0.001382
2020-10	-0.03158	-0.02536	-0.01737	-0.001023	2023-09	-0.00100	0.01112	0.10811	-0.001515
2020-11	0.10558	-0.04648	-0.04694	-0.000952	2023-10	-0.03543	0.00186	0.03517	-0.001907
2020-12	0.03276	-0.02553	0.02226	-0.000929	2023-11	0.05619	-0.03008	-0.06574	-0.001967
2021-01	-0.00006	0.00633	0.02854	-0.000914	2023-12	0.00757	-0.02339	-0.05349	-0.001337
2021-02	0.02619	-0.01023	0.08189	-0.001027	2024-01	0.07618	0.01122	0.08623	-0.001535
2021-03	0.05821	0.05092	0.10137	-0.001045	2024-02	0.04324	-0.00609	0.01319	-0.001237
2021-04	-0.03193	-0.01614	-0.02769	-0.001024	2024-03	0.04421	-0.00058	0.06309	-0.000522
2021-05	0.01635	-0.01452	0.03189	-0.001107	2024-04	-0.02150	0.01956	0.09026	0.000148
2021-06	0.00812	0.02777	-0.02537	-0.001050	2024-05	0.01166	-0.00886	0.02339	0.000598
2021-07	-0.01998	-0.00242	0.02596	-0.001079	2024-06	0.01641	0.04420	0.00324	0.000288
2021-08	0.03118	-0.00184	-0.02661	-0.001209	2024-07	0.00069	-0.06352	-0.05733	0.000346
2021-09	0.04912	0.00224	0.03446	-0.001212	2024-08	-0.03975	-0.03199	-0.09315	0.001064
2021-10	-0.02259	0.00927	0.00668	-0.001148	2024-09	-0.01417	-0.00586	-0.02046	0.000834
2021-11	-0.03375	-0.02081	-0.03071	-0.001344	2024-10	0.02874	0.04094	0.08680	0.000238
2021-12	0.03037	0.00797	0.08052	-0.001278	2024-11	-0.00652	-0.00979	0.01233	0.000926
2022-01	-0.04897	-0.05129	0.16552	-0.001007	2024-12	0.01750	-0.01594	-0.00209	0.001344
2022-02	-0.00221	0.02072	0.01813	-0.000920					

Table 13. Monthly Fama–French Factor Returns (JPY), April 2019–December 2024.

## B PERFORMANCE SUMMARY FOR ALL 36 PORTFOLIO CONFIGURATIONS

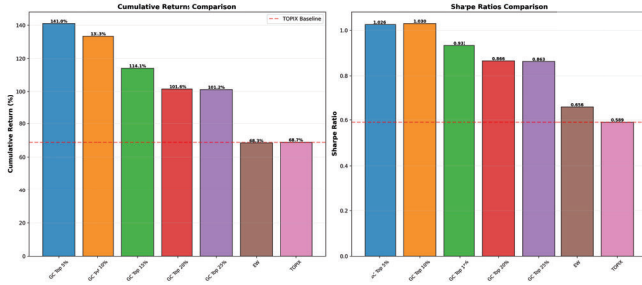
This section presents detailed performance metrics for all 36 portfolio configurations evaluated in the study. Each configuration combines two filtering methodologies (Industry-level vs. Firm-level), three coverage thresholds (90%, 80%, 70%), and six strategies (five Golden Cross concentration levels and one equal-weighted benchmark). All results span the 297-week period from April 5, 2019 to December 6, 2024. The TOPIX benchmark returned 68.68% over this period.

Method	Threshold	Name	N Stocks	Return (%)	Sharpe	Max DD (%)	TOPIX Excess (%)
Industry	70% Coverage	GC Top 5%	15	127.50	0.995	-24.84	58.82
		GC Top 10%	32	126.89	0.991	-26.53	58.21
		GC Top 15%	47	121.57	0.968	-27.47	52.89
		GC Top 20%	63	100.89	0.865	-27.63	32.21
		GC Top 25%	75	109.03	0.914	-27.76	40.35
		EW Benchmark	330	68.84	0.673	-27.61	0.16
	80% Coverage	GC Top 5%	22	129.99	0.993	-26.84	61.31
		GC Top 10%	45	112.33	0.924	-27.68	43.65
		GC Top 15%	68	107.12	0.894	-27.51	38.44
		GC Top 20%	91	94.42	0.825	-28.21	25.74
		GC Top 25%	106	94.02	0.825	-28.67	25.34
		EW Benchmark	475	64.59	0.633	-27.48	-4.09
	90% Coverage	GC Top 5%	29	140.98	1.026	-27.81	72.30
		GC Top 10%	58	133.33	1.030	-26.81	64.65
		GC Top 15%	86	114.16	0.933	-27.10	45.48
		GC Top 20%	115	102.90	0.872	-27.53	34.22
		GC Top 25%	137	98.97	0.850	-28.52	30.29
		EW Benchmark	604	68.27	0.656	-27.80	-0.41
Firm	70% Coverage	GC Top 5%	28	130.01	0.955	-28.72	61.33
		GC Top 10%	56	118.66	0.914	-28.66	49.98
		GC Top 15%	84	103.82	0.845	-29.38	35.14
		GC Top 20%	112	100.95	0.833	-29.48	32.27
		GC Top 25%	136	101.26	0.830	-30.23	32.58
		EW Benchmark	587	86.92	0.728	-31.62	18.24
	80% Coverage	GC Top 5%	32	120.84	0.925	-28.42	52.16
		GC Top 10%	64	116.68	0.922	-27.85	48.00
		GC Top 15%	97	104.59	0.859	-28.90	35.91
		GC Top 20%	129	99.31	0.832	-29.20	30.63
		GC Top 25%	156	93.14	0.793	-29.78	24.46
		EW Benchmark	678	85.18	0.725	-31.38	16.50
	90% Coverage	GC Top 5%	36	129.02	0.967	-28.37	60.34
		GC Top 10%	73	110.14	0.890	-28.17	41.46
		GC Top 15%	109	106.44	0.865	-29.04	37.76
		GC Top 20%	146	95.99	0.810	-29.63	27.31
		GC Top 25%	177	88.75	0.763	-30.49	20.07
		EW Benchmark	764	84.35	0.721	-31.63	15.67

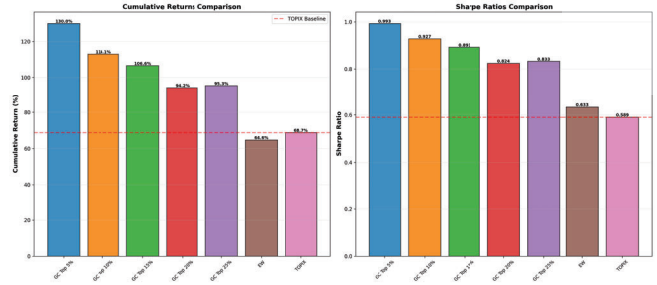
**Table 14.** Performance Summary for All 36 Portfolio Configurations (30 Golden Cross + 6 Equal-Weighted Benchmarks).

### C BAR CHART COMPARISONS ACROSS ALL DATA PATTERNS

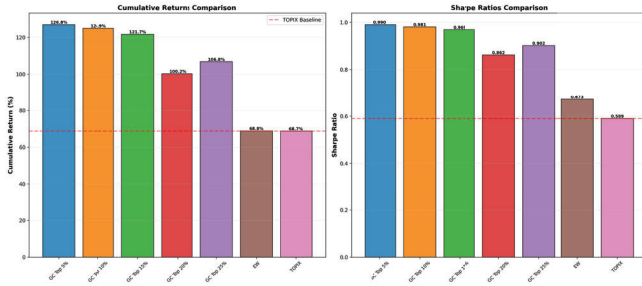
This section compares total returns and Sharpe ratios for all Golden Cross concentration strategies across six data patterns. Each subplot displays the performance of five Golden Cross variants (Top 5–25%), the equal-weighted benchmark, and the TOPIX baseline.



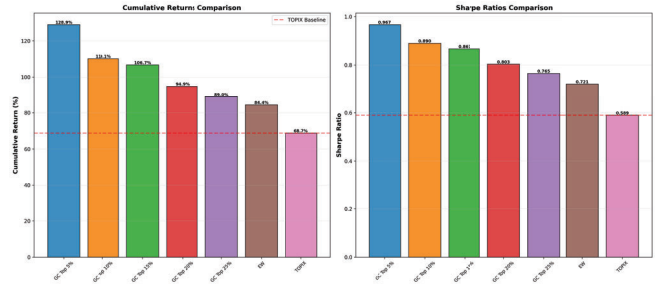
(a) Industry 90% Coverage



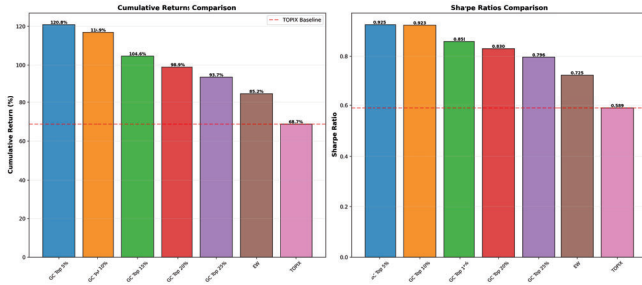
(b) Industry 80% Coverage



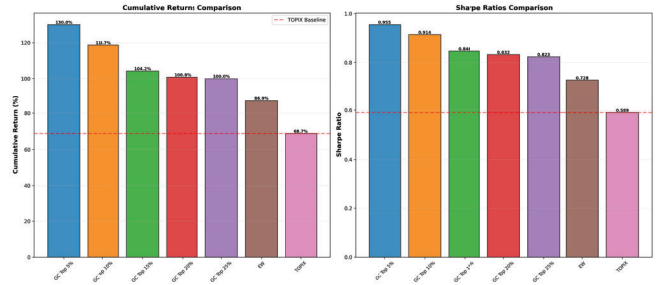
(c) Industry 70% Coverage



(d) Firm 90% Coverage



(e) Firm 80% Coverage

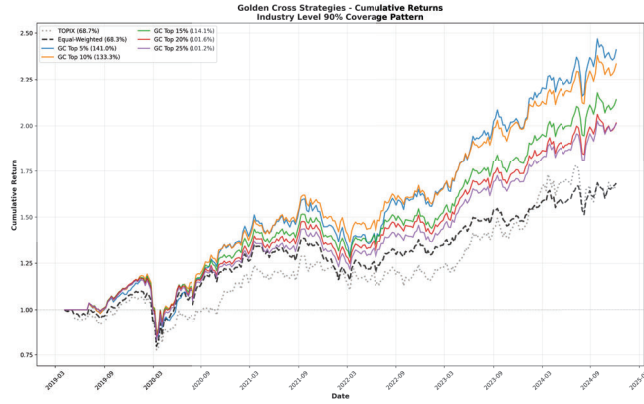


(f) Firm 70% Coverage

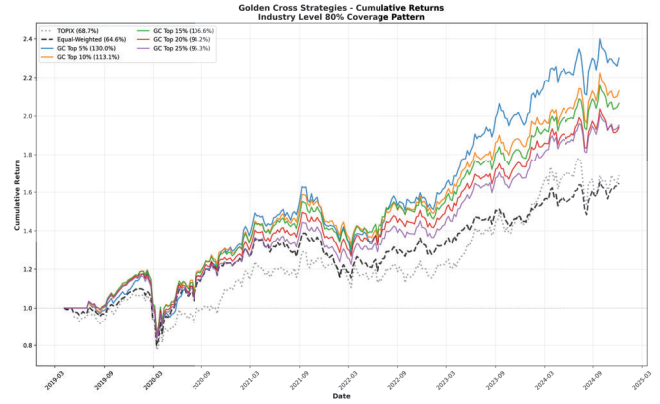
Figure 7. Bar Chart Comparison of Returns and Sharpe Ratios Across All Data Patterns.

## D CUMULATIVE RETURN TRAJECTORIES ACROSS ALL SIX DATA CONFIGURATIONS

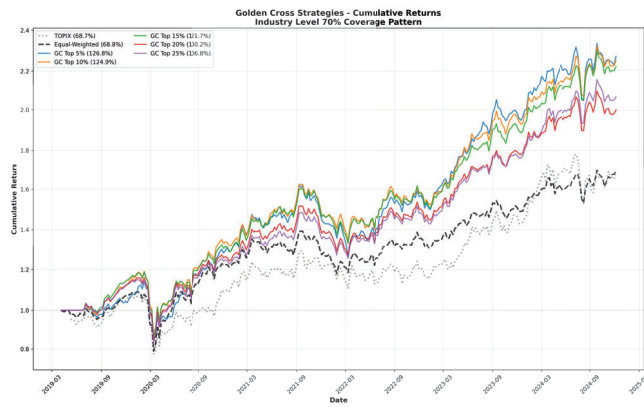
This section illustrates cumulative return trajectories over the 297-week sample period for all Golden Cross strategies, equal-weighted benchmarks, and the TOPIX baseline. The charts highlight the consistent outperformance of Golden Cross strategies relative to passive alternatives.



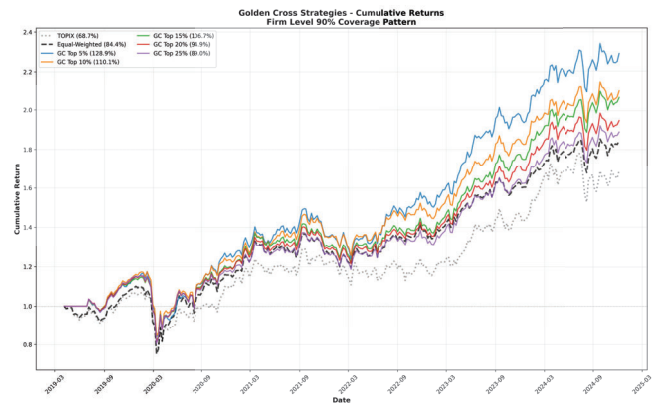
(a) Industry 90% Coverage



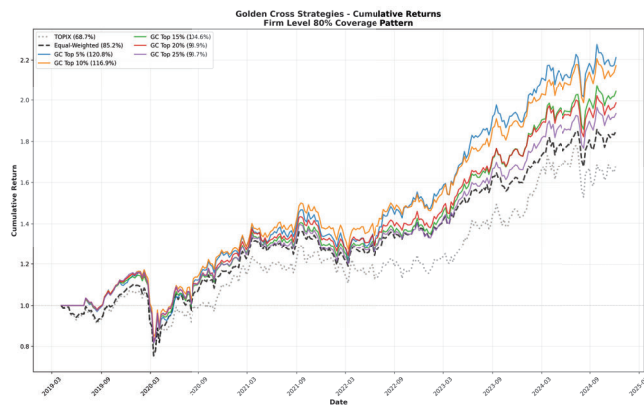
(b) Industry 80% Coverage



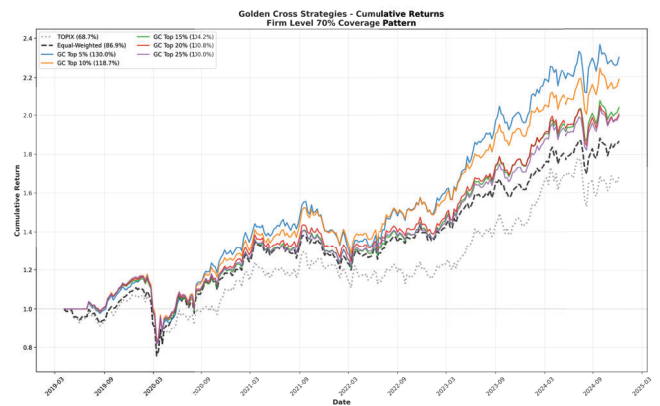
(c) Industry 70% Coverage



(d) Firm 90% Coverage



(e) Firm 80% Coverage



(f) Firm 70% Coverage

Figure 8. Cumulative Return Trajectories Across All Six Data Configurations.

## E TIME-VARYING FAMA-FRENCH FACTOR LOADINGS ACROSS ALL SIX DATA CONFIGURATIONS

This section presents time-varying Fama–French three-factor loadings estimated using 12-month rolling windows for all six data patterns. Each subplot displays over the estimated Alpha, Market Beta, SMB (size), and HML (value) coefficients over the 69-month sample period.

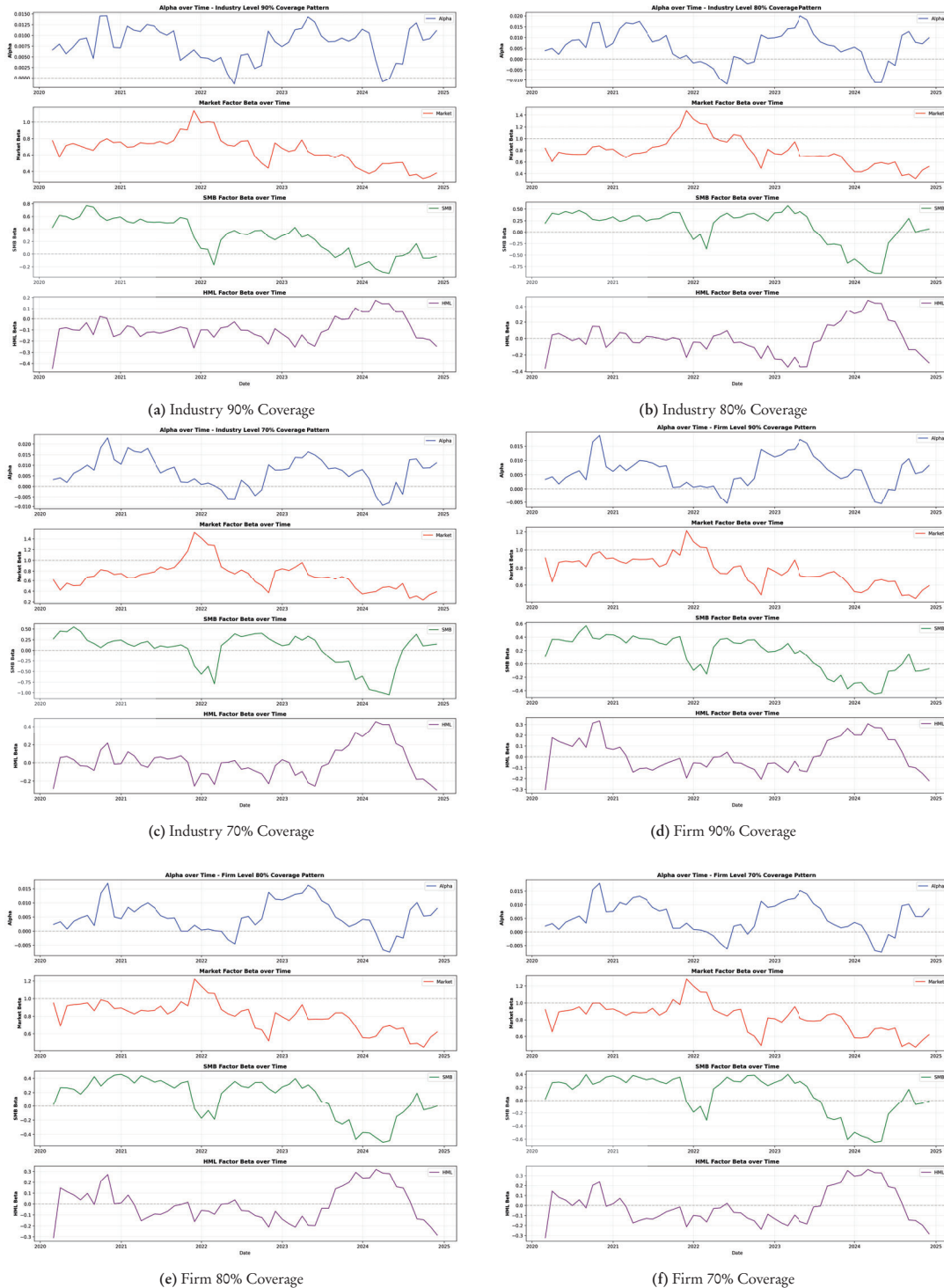


Figure 9. Time-Varying Fama–French Factor Loadings Across All Six Data Configurations.