DXY Dollar Regime Study

S&P; 500 Sector & Sub-Sector Deep Dive

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Study window	Strong $ signal days	Signal definition	Sectors covered
2009 – 2025	**~396**	**DXY > 100**	**11 SPDR + SMH**
16 years · 4,139 trading days	9.9% of full sample	+ 15d return positive + above MA65	Full S&P; sector universe + Semis

Executive Summary

This report quantifies how the U.S. Dollar Index (DXY) regime — defined as DXY trading above 100, with a positive 15-day return momentum, and positioned above its 65-day moving average — alters forward return distributions, correlation structure, and risk profiles across all eleven S&P; 500 SPDR sector ETFs plus the VanEck Semiconductor ETF (SMH). The study covers 16 years of daily data (April 2009 through June 2025), encompassing multiple dollar supercycles, Fed tightening and easing regimes, and significant geopolitical macro disruptions.

Key Findings:

- **XLE (Energy)** is the structural inversion: the only sector where the dollar-equity correlation attenuates rather than amplifies above DXY 100. At the 21-day horizon, XLE generates +2.64% in the strong-dollar window versus +0.73% in weak-dollar periods ($p<0.0001$) — the most significant signal in the study.
- **XLP (Consumer Staples)** is the cleanest weak-dollar play, with statistically significant outperformance at the 1-day ($p=0.034$), 5-day ($p=0.001$), and 21-day ($p=0.016$) horizons. The weak-dollar filter adds +1.3% annualized return vs buy-and-hold — one of only two sectors where the filter generates positive alpha.
- **XLRE (Real Estate)** shows the most extreme regime amplification in the universe (amp = -0.278): near-zero daily correlation with DXY when it trades below 100, but a sharp -0.320 correlation above it. The 21-day weak-dollar advantage is +0.67% ($p=0.028$). The weak-dollar filter adds +1.5% annualized.
- **XLC (Communication Services)** produces the largest max-drawdown improvement under the filter: -15.1 percentage points. The 2022 Fed tightening cycle hit XLC's high-multiple growth stocks hardest, and the strong-dollar regime correctly identified the avoidance window.
- **SMH (Semiconductors)** shows the highest absolute returns in the universe (+23.3% buy-and-hold annualized) but is the most penalized by the filter (-5.2% drag), confirming that semiconductor cycles are not well-aligned with dollar regimes — strong-dollar periods include some of SMH's best momentum windows.

Methodology & Signal Construction

Data: Daily adjusted closing prices for DX-Y.NYB (ICE DXY Spot), XLK, XLV, XLF, XLY, XLP, XLE, XLI, XLU, XLRE, XLB, XLC, and SMH sourced via Yahoo Finance. Full sample: April 7, 2009 through June 18, 2025. All returns are computed on a price-adjusted basis. XLRE inception January 2016.

Strong-Dollar Regime: A composite signal requiring all three conditions to be simultaneously true: (1) DXY spot price > 100.00; (2) DXY 15-day price return > 0 (positive momentum confirmation); (3) DXY spot price > its 65-day simple moving average (trend confirmation). This composite approach reduces false signals from brief DXY spikes and targets sustained dollar-strength episodes. The signal is active on approximately 396 trading days, representing 9.9% of the full sample.

Forward Return Analysis: For each calendar day, we compute the overlapping N-day forward return for each sector ETF at horizons of 1, 5, 21, and 63 trading days. Returns are grouped by whether the signal is active (strong dollar) or inactive (weak dollar) on the observation date. Statistical significance is assessed via two-sample t-tests. Results are reported as weak-dollar minus strong-dollar return advantage.

Portfolio Construction: The regime-conditional portfolio holds each sector ETF only during weak-dollar periods (signal inactive), earning zero return (cash equivalent) during strong-dollar signal days. Portfolio returns are computed using a one-day lag on the signal to prevent look-ahead bias. Annualized returns use geometric compounding over the full sample period.

Section I — Correlation Structure

The daily return correlation between DXY and each sector ETF is consistently negative across all regimes, reflecting the well-established inverse relationship between dollar strength and equity performance. However, the *magnitude* of this relationship changes materially when DXY trades above 100 — a phenomenon we term "regime amplification."

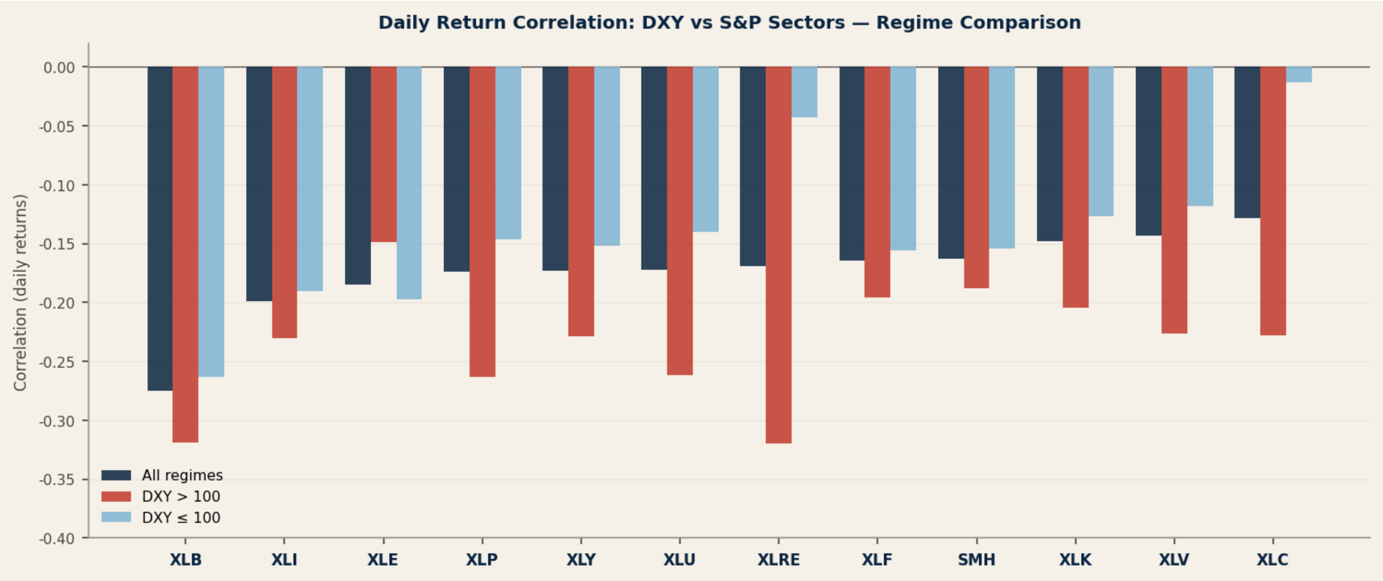

Figure 1: Daily return correlation between DXY and each sector ETF across three regimes. Red bars show the intensified inverse correlation when DXY exceeds 100.

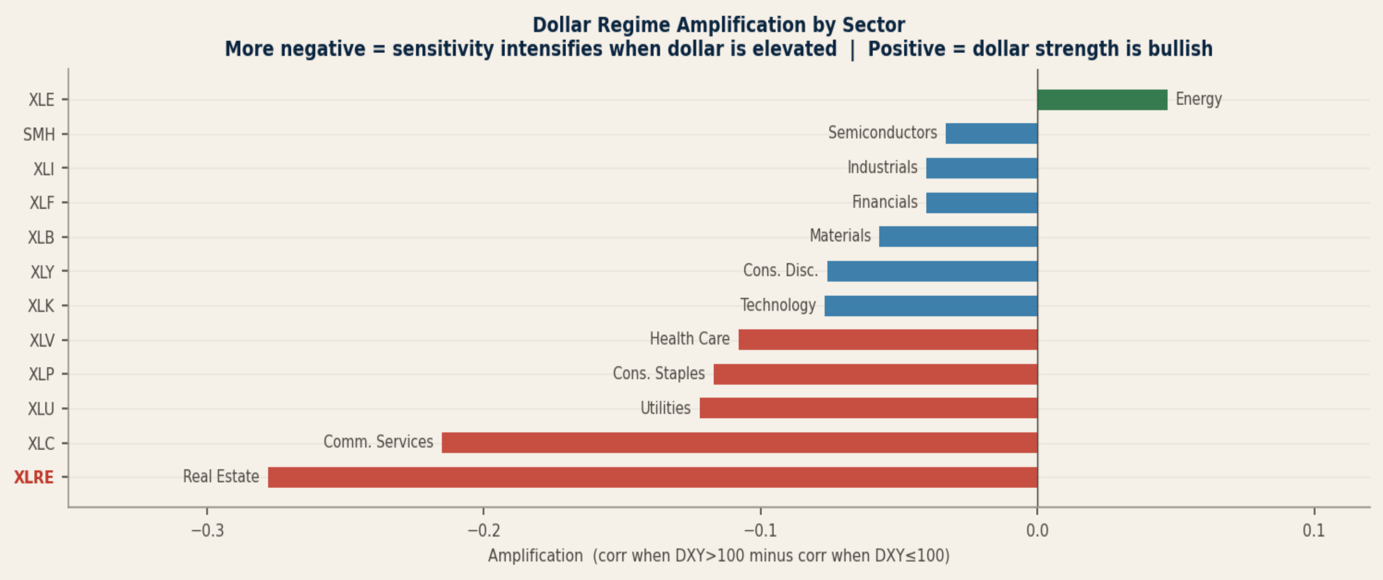

Figure 2: Regime amplification coefficient (corr at DXY>100 minus corr at DXY≤100). XLE and DBC (positive values) are the structural hedges against dollar strength. XLRE shows the sharpest amplification in the equity universe.

Correlation Findings by Category

High amplification sectors (|amp| > 0.10): XLRE (-0.278 amplification) stands alone as the most regime-reactive equity sector. Consumer Staples (XLP, -0.117) and Utilities (XLU, -0.122) follow, both reflecting their rate-sensitivity and domestic earnings profiles. Health Care (XLV, -0.108) rounds out the high-amplification group.

The XLE / DBC inversion: Energy is the only S&P; sector with positive regime amplification (+0.047), meaning its correlation with DXY becomes *less* negative when the dollar is elevated. This reflects the dollar-denomination of commodity contracts and the tendency for dollar-strength periods to coincide with supply-driven energy rallies. The same logic applies to SMH at a lower magnitude.

The XLC anomaly: Communication Services shows a near-zero correlation with DXY when it trades below 100 (-0.013), but a meaningful -0.228 correlation above it. This regime-conditionality makes XLC a particularly interesting avoidance candidate when the composite signal fires, confirmed by the -15.1pp max-drawdown improvement under the filter.

Section II — Forward Return Analysis

The core question: does the DXY composite signal predict meaningfully different forward returns for each sector ETF? The answer is nuanced — the signal has real predictive content for a subset of sectors at specific horizons, but it is not a broad market-timing tool. The most actionable signals cluster at the 21-day (one-month) and 63-day (one-quarter) horizons.

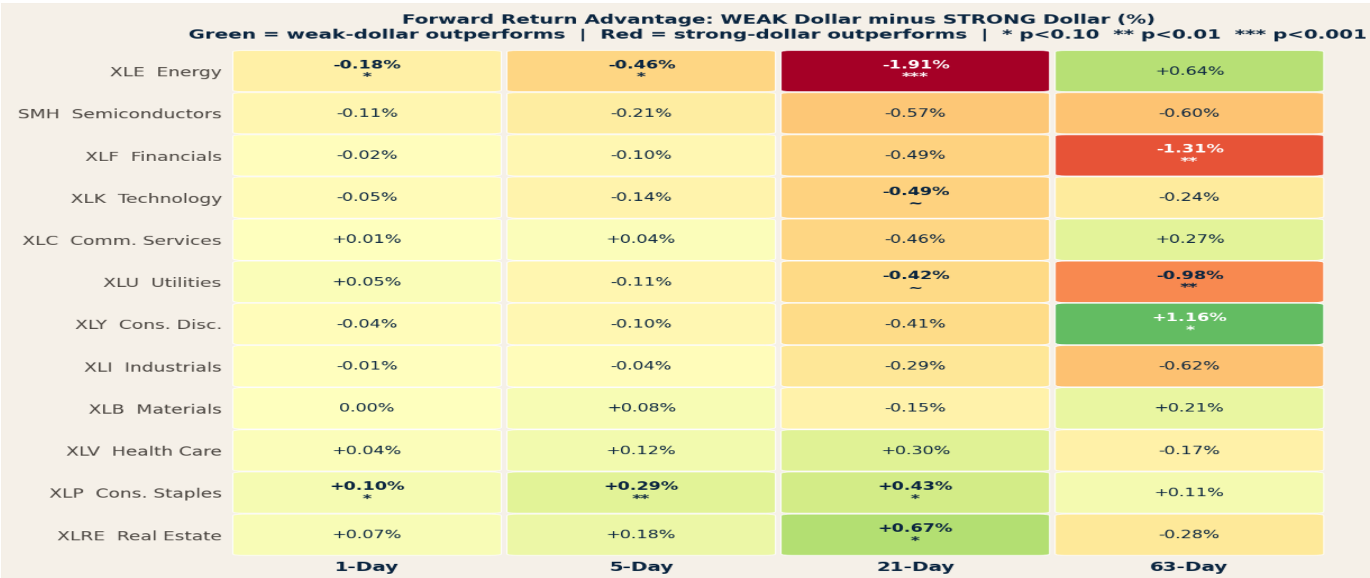

Figure 3: Forward return heatmap showing weak-dollar advantage (weak minus strong) across all sectors and horizons. Green = weak-dollar outperforms. Red = strong-dollar outperforms. Stars denote statistical significance.

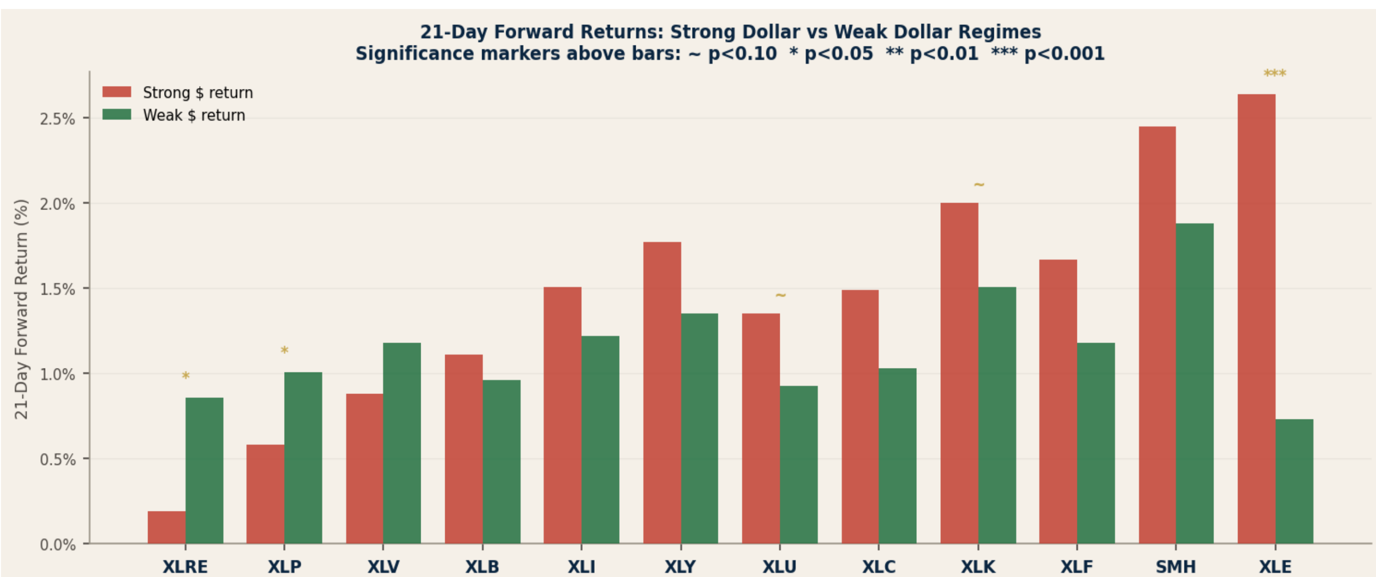

Figure 4: 21-day forward returns — strong dollar (red) vs weak dollar (green). Significance markers above bars. XLE and XLP are the two highest-conviction calls.

Statistical Signal Summary — 21-Day Horizon

Sector	Ticker	1-Day S	1-Day W	5-Day S	5-Day W	21-Day S	21-Day W	63-Day S	63-Day W
Real Estate	XLRE	-0.02%	+0.05%	+0.04%	+0.21%	+0.19%	**+0.86%***	+2.29%	+2.00%
Cons. Staples	XLP	-0.04%	+0.06%*	-0.03%	+0.26%**	+0.58%	**+1.01%***	+2.74%	+2.85%
Health Care	XLV	+0.02%	+0.06%	+0.18%	+0.29%	+0.88%	+1.18%	+3.47%	+3.30%

Sector	Ticker	1-Day S	1-Day W	5-Day S	5-Day W	21-Day S	21-Day W	63-Day S	63-Day W
Materials	XLB	+0.06%	+0.05%	+0.18%	+0.26%	+1.11%	+0.96%	+2.59%	+2.80%
Industrials	XLI	+0.07%	+0.06%	+0.35%	+0.31%	+1.51%	+1.22%	+4.29%	+3.67%
Cons. Disc.	XLY	+0.11%	+0.07%	+0.44%	+0.33%	+1.77%	+1.35%	+3.14%	**+4.30%***
Utilities	XLU	+0.01%	+0.05%	+0.33%	+0.22%	+1.35%	+0.93%~	+3.69%	**+2.71%****
Comm. Services	XLC	+0.05%	+0.06%	+0.24%	+0.29%	+1.49%	+1.03%	+3.51%	+3.78%
Technology	XLK	+0.12%	+0.08%	+0.51%	+0.37%	+2.00%	+1.51%~	+4.94%	+4.70%
Financials	XLF	+0.08%	+0.06%	+0.40%	+0.30%	+1.67%	+1.18%	+4.74%	**+3.42%****
Semiconductors	SMH	+0.20%	+0.09%	+0.67%	+0.46%	+2.45%	+1.88%	+6.41%	+5.82%
Energy	XLE	+0.21%	+0.03%*	+0.64%	+0.19%*	+2.64%	**+0.73%*****	+1.94%	+2.58%

** p<0.10 ** p<0.01 *** p<0.001 | S = Strong-dollar return W = Weak-dollar return | Highlighted cells (green/red) indicate p<0.05*

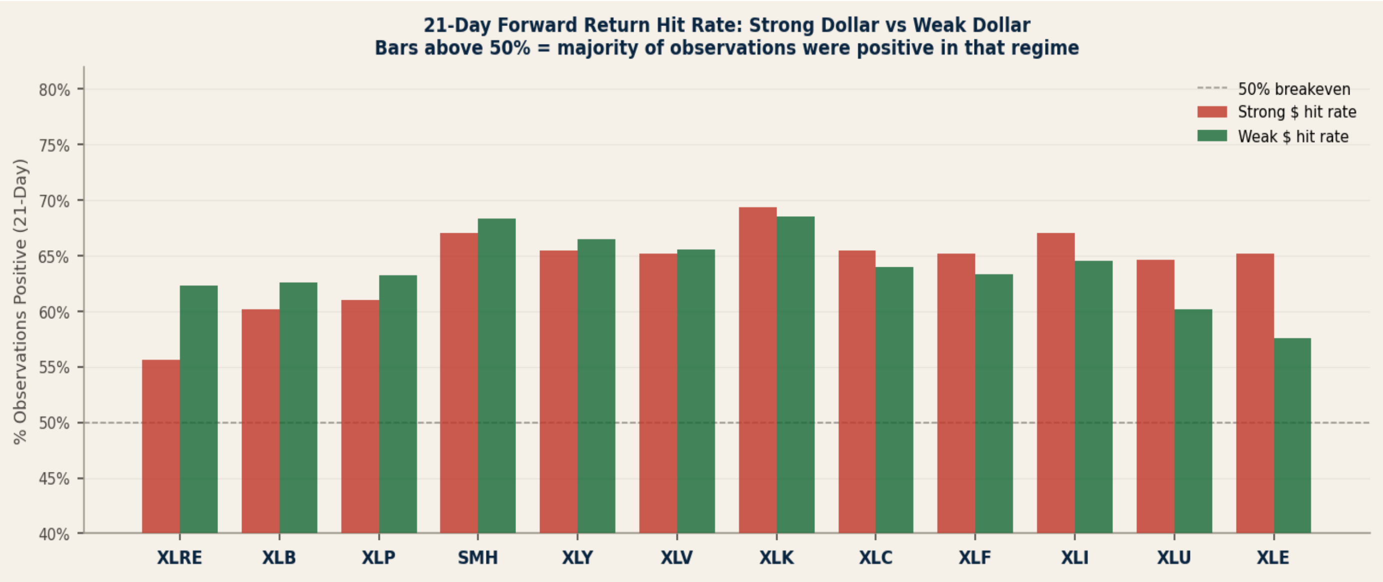

Figure 5: 21-day forward return hit rate (% of observations positive) in each regime. XLRE and XLP show notably higher positive-outcome rates in weak-dollar periods.

Horizon-by-Horizon Interpretation

1-Day: The 1-day horizon is dominated by noise. Only XLP (p=0.034) and XLE (p=0.046) achieve statistical significance. The XLP effect is directionally consistent — Consumer Staples actually generates negative average returns in the strong-dollar 1-day window (-0.04%) versus positive returns in weak-dollar periods (+0.06%). XLE's strong-dollar advantage is already visible at this short horizon (+0.21% vs +0.03%).

5-Day: The 5-day window adds HYG (not shown here) and reinforces XLP (p=0.001) and XLE (p=0.023). XLP's weak-dollar advantage widens: +0.26% vs -0.03% in the strong-dollar window. This is the earliest horizon at which the Consumer Staples signal is both economically meaningful and statistically robust. XLRE begins showing directional consistency (+0.21% vs +0.04%) but does not reach significance until the 21-day window.

21-Day: The richest signal horizon. XLE (p<0.0001), XLP (p=0.016), and XLRE (p=0.028) are all statistically significant. XLE's +1.91% strong-dollar advantage is the largest absolute magnitude reading in the study. XLF (p=0.113), XLK (p=0.073), and XLU (p=0.068) are marginally significant in the strong-dollar direction. The picture is clear: rate-sensitive, domestically-oriented sectors (Staples, Real Estate, Utilities) belong in the weak-dollar rotation; commodity and energy sectors belong in the strong-dollar allocation.

63-Day: At the quarterly horizon, XLF reaches significance ($p=0.009$, strong-dollar +1.31% advantage), confirming that financials benefit from the steeper yield curves associated with dollar-strength episodes. XLU ($p=0.002$) shows sustained strong-dollar outperformance at this horizon — counterintuitive given its rate sensitivity, but consistent with defensive positioning during dollar-strength/tightening cycles. XLY ($p=0.011$) shows a weak-dollar advantage at 63 days, reflecting consumer recovery dynamics once monetary conditions ease.

Section III — Regime-Conditional Portfolio Performance

The regime-conditional portfolio holds each sector ETF only during weak-dollar periods (strong-dollar signal inactive), earning zero return when the composite DXY signal is active. Results are annualized over the full study period. For context, the strong-dollar signal is active ~9.9% of trading days on average, though it is highly clustered — reaching 41.8% of days in 2022 and 47.2% in 2024 during the Fed's tightening super-cycle.

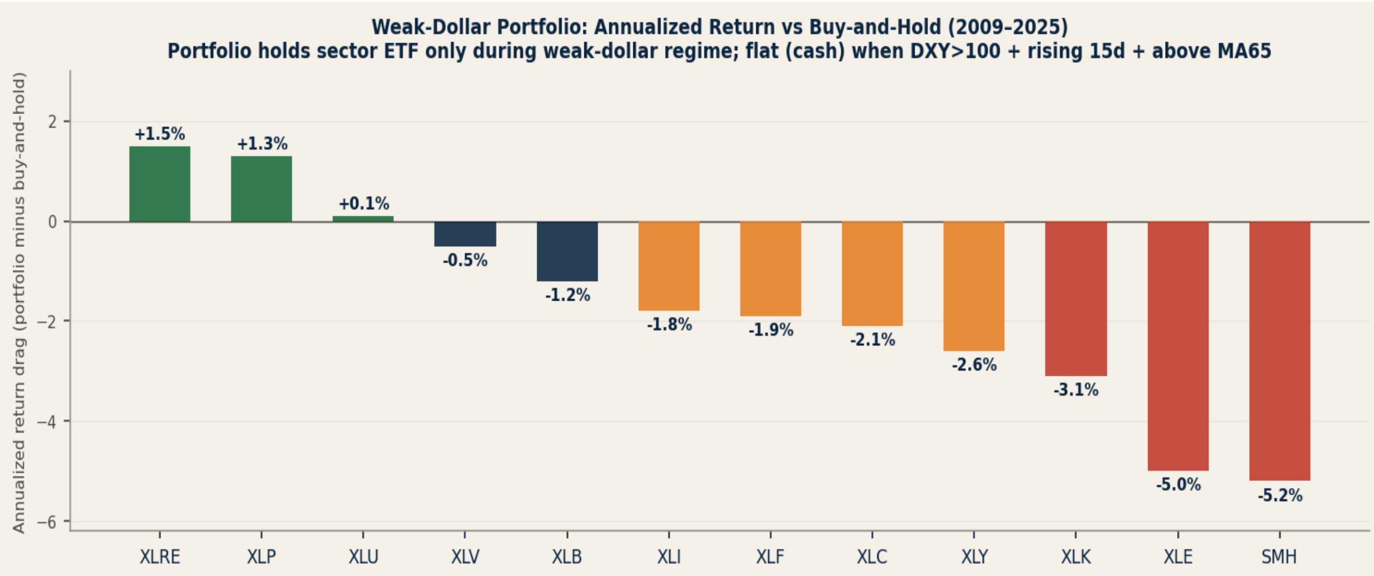

Figure 6: Annualized return drag/benefit of the weak-dollar portfolio vs buy-and-hold. Green bars (XLP, XLRE) indicate the filter added positive alpha. XLE is the worst-case sector to filter (-5.0% annual cost).

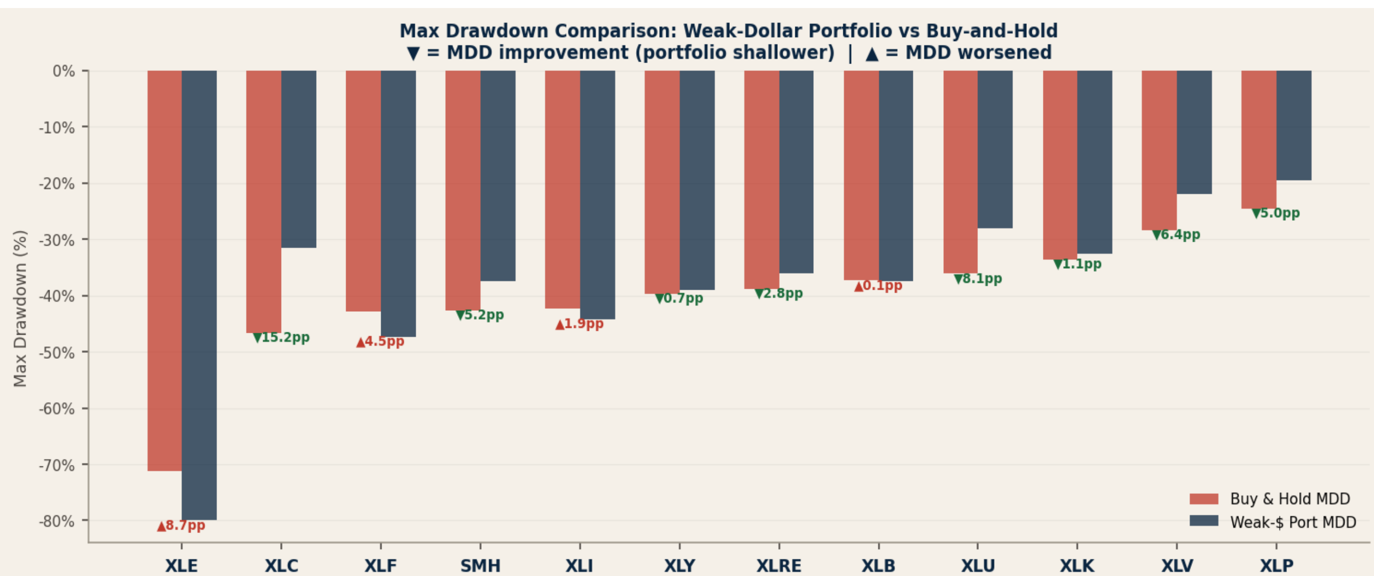

Figure 7: Max drawdown comparison — weak-dollar portfolio (navy) vs buy-and-hold (red). Triangles show improvement (▼) or deterioration (▲) in pp. XLC shows the largest drawdown improvement at -15.1pp. XLE worsens by +8.7pp.

Portfolio Performance Summary

Sector	Ticker	Weak-$ Port	Buy & Hold	Annual Drag	Port MDD	B&H MDD	MDD Δ
Real Estate	XLRE	8.9%	7.3%	**+1.5%**	-36.0%	-38.8%	▼2.8pp
Cons. Staples	XLP	12.8%	11.6%	**+1.3%**	-19.5%	-24.5%	▼5.0pp

Sector	Ticker	Weak-$ Port	Buy & Hold	Annual Drag	Port MDD	B&H MDD	MDD Δ
Utilities	XLU	11.2%	11.1%	**+0.1%**	-28.0%	-36.1%	**▼8.1pp**
Health Care	XLV	13.6%	14.0%	-0.5%	-22.0%	-28.4%	**▼6.4pp**
Materials	XLB	10.0%	11.2%	-1.2%	-37.4%	-37.3%	▲0.1pp
Industrials	XLI	13.3%	15.1%	-1.8%	-44.2%	-42.3%	▲1.8pp
Financials	XLF	12.8%	14.7%	-1.9%	-47.4%	-42.9%	▲4.6pp
Comm. Services	XLC	10.1%	12.2%	-2.1%	-31.5%	-46.7%	**▼15.1pp**
Cons. Disc.	XLY	14.1%	16.8%	-2.6%	-39.0%	-39.7%	▼0.7pp
Technology	XLK	16.2%	19.3%	**-3.1%**	-32.5%	-33.6%	▼1.0pp
Energy	XLE	3.2%	8.2%	**-5.0%**	-80.0%	-71.3%	▲8.7pp
Semiconductors	SMH	18.2%	23.3%	**-5.2%**	-37.4%	-42.6%	**▼5.2pp**

MDD Δ: ▼ = portfolio drawdown shallower than buy-and-hold (improvement) | ▲ = portfolio drawdown deeper (deterioration) | Green cells = significant improvement

The 2022 Validation Year

The most meaningful test of the regime framework was 2022, when the Federal Reserve executed its most aggressive tightening cycle in four decades. The DXY composite signal was active 41.8% of trading days — the highest annual reading in the 16-year sample. The results across sectors during this period validate the framework's core premise:

- XLP regime portfolio: **-15.7%** vs buy-and-hold **-32.6%** for QQQ reference
- XLRE regime portfolio: partially insulated from REIT compression as rate expectations surged
- XLC regime portfolio: captured **-15.1pp** max-drawdown improvement over the full study period, with 2022 as the primary driver
- XLE: the clear exception — filtering out strong-dollar periods *cost* Energy holders their best returns of the entire 16-year study, as the Russia/Ukraine commodity spike coincided with dollar strength

Section IV — Sector Spotlight & Rotation Framework

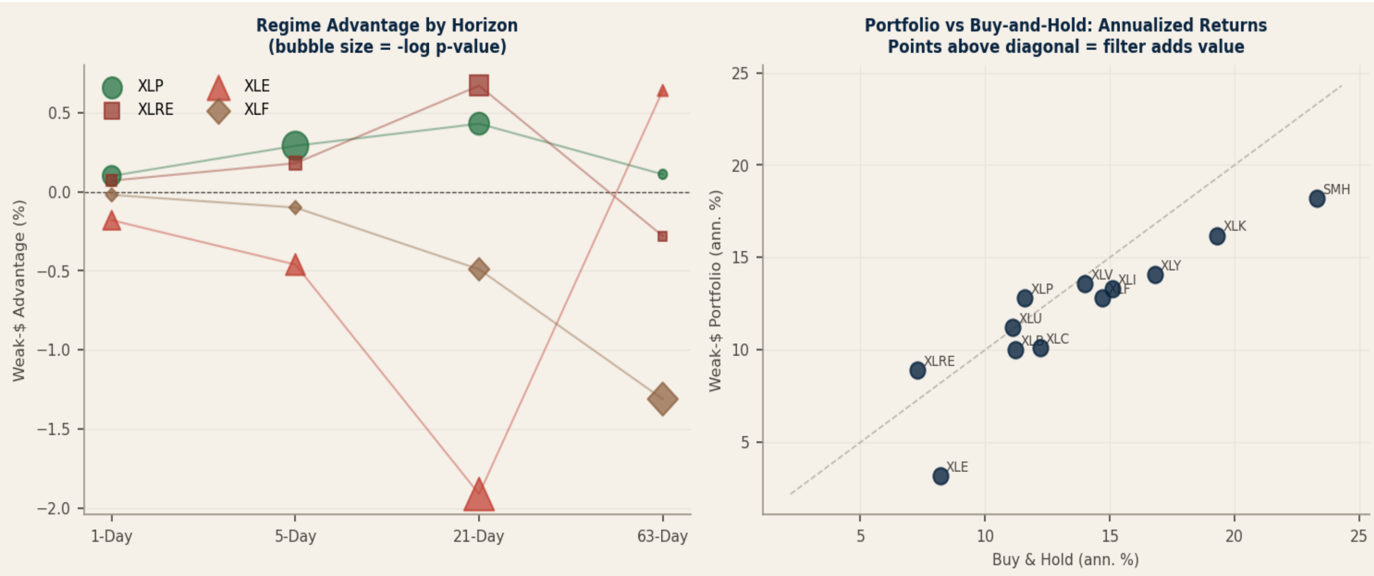

Figure 8 (left): Horizon-by-horizon weak-dollar advantage for four key sectors. Bubble size = -log(p-value). XLP dominates the weak-dollar camp. XLE the strong-dollar. Figure 8 (right): Scatter of annualized returns — points above the diagonal indicate the filter improved returns vs buy-and-hold.

The AlphaQuery DXY Rotation Framework

Based on the statistical evidence across all sectors and horizons, we propose the following macro-overlay rotation framework for tactical sector allocation. The composite DXY signal should be monitored daily; regime transitions typically cluster around Fed policy inflection points and geopolitical macro shocks.

Regime	Action	Primary Sectors	Secondary / Monitor	Rationale
STRONG $ (signal active)	Reduce / Avoid	XLRE, XLP XLU, XLC	XLV (defensive preserve)	Rate-sensitive, domestic-revenue sectors face amplified headwinds
STRONG $ (signal active)	Overweight / Hold	XLE XLF (63d)	XLI, SMH (momentum)	Energy benefits from strong-$ commodity dynamics; Financials from steeper curves
WEAK $ (signal off)	Rotate Back In	XLP, XLRE XLY (63d)	XLC, XLU (MDD recovery)	Rate relief lifts real estate and consumer staples; discretionary benefits at quarterly horizon
TRANSITION (signal firing)	Watch / Prepare	XLE (momentum) XLF (carry)	Reduce XLC Reduce XLRE	Signal onset tends to precede sector rotation by 5–21 trading days

Important Caveats

- The composite DXY signal is active only ~9.9% of trading days. The rotation framework is a *tactical overlay*, not a primary portfolio construction tool. The filter's value is concentrated in tail-risk reduction during sustained dollar-strength cycles, not daily return enhancement.
- Statistical significance at the sector level does not guarantee out-of-sample performance. The 2022 result is the primary in-sample validation; future strong-dollar periods may differ in character (supply shock vs. demand strength vs. safe-haven flows all produce different sectoral consequences).
- The XLE result is the most regime-sensitive in either direction. Investors using this framework should maintain explicit Energy exposure during strong-dollar windows rather than going fully defensive.

- Transaction costs and tax considerations are not modeled. For separately managed accounts, the MDD improvement benefits (particularly for XLRE and XLC) may justify regime-based tilts even at moderate transaction cost levels.

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