Investment Policy Statement (IPS) Framework

Version 3.9

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Executive Summary

This Investment Policy Statement outlines a systematic, probability-weighted approach to portfolio management based on macro regime analysis. The framework monitors 13 indicators across 4 themes to determine scenario probabilities and optimize allocation accordingly.

Core Innovation: Rather than static allocation, the portfolio dynamically adjusts based on the probability-weighted expected outcomes across 16 possible macro scenarios, with risk minimization to protect against scenario divergence.

Version 3.7 Enhancement: Transition probabilities now incorporate distance-to-trigger calculations, preventing premature regime change signals when indicators show momentum but remain far from their moving average crossing points.

Version 3.8 Philosophy: Default to adaptive MA comparisons over fixed thresholds for more responsive regime detection. Implemented three-tier signal liquidity framework for balanced early warning and confirmation.

Philosophical Framework for Indicator Design (v3.8)

Core Principle: Adaptive MA Comparisons

The framework defaults to comparing moving averages of different periods rather than fixed thresholds. This creates adaptive triggers that adjust to changing market regimes.

Use MA Comparisons When:

- The indicator measures continuous market dynamics
- Historical "normal" levels change over time
- Relative change matters more than absolute level
- Both numerator and denominator are raw values

Use Fixed Thresholds Only When:

- Denominator already contains long-term smoothing (e.g., CAPE = Price/10Y Earnings)

- Zero represents a fundamental boundary (e.g., TIC flows direction)

- Psychological levels have proven statistical significance

Signal Liquidity Framework (NEW v3.8)

Indicators are classified into three tiers based on update frequency and responsiveness:

Canary Indicators (30-35% theme weight)

- **Purpose**: Early warning signals with daily liquidity

- **Update**: Daily, real-time

- **Characteristics**: Liquid markets, minimal lag, some noise acceptable

- **Examples**: DXY Index, QQQ/SPY, Equity Risk Premium, ACWX/SPY

Primary Indicators (35-50% theme weight)

- **Purpose**: Core theme measurement with balanced signal quality

- **Update**: Weekly to monthly

- **Characteristics**: Reliable data, moderate smoothing, main theme drivers

- **Examples**: Forward P/E, Productivity, Net Margins, CAPE

Structural Indicators (20-30% theme weight)

- **Purpose**: Long-term confirmation, whipsaw reduction

- **Update**: Quarterly or with significant lag

- **Characteristics**: Slow-moving, high confidence, regime confirmation

- **Examples**: USD Reserve Share, Central Bank Gold, Yuan SWIFT Share

This tiered approach balances early detection with false signal reduction.

Core Beliefs

1. **Markets are regime-dependent** - Different macro environments require different exposures

2. **Diversification across scenarios** beats diversification within a single scenario

3. **Risk management** should focus on avoiding catastrophic outcomes in any probable scenario

4. **Systematic beats discretionary** - Rules-based approach removes emotional bias

5. **Probability-weighted optimization** captures uncertainty better than point forecasts

Investment Objectives

- **Primary**: Achieve 8-12% annual returns across market cycles

- **Secondary**: Limit maximum drawdown to 15% in any 12-month period

- **Tertiary**: Maintain liquidity for opportunistic investments

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Asset Allocation Framework

Security Universe

Equity Exposures:

- VTI (US Total Market)

- VEA (Developed International)

- VWO (Emerging Markets)

- SMH (Semiconductors)

- SRVR (Infrastructure/Data Centers)

Income Exposures:

- PIMIX (PIMCO Income Fund)

- PYLD (PIMCO Yield Opportunities)

Alternative Exposures:

- GLD (Gold)

- COM (Commodities)

- IGF (Global Infrastructure)

- DBMF (Managed Futures)

Cash:

- SWVXX (Money Market)

Scenario-Based Framework

The portfolio recognizes 16 scenarios based on 4 binary themes evaluated through 13 indicators:

- **USD Dominance** (weak/strong) - 4 indicators

- **AI Productivity Boom** (yes/no) - 3 indicators

- **P/E Mean Reversion** (yes/no) - 3 indicators

- **International Outperformance** (yes/no) - 4 indicators (including new ACWX/SPY)

Note: Reduced from 14 to 13 indicators in v3.8 by removing DXY Level duplication.

Each scenario has optimal allocations determined through mean-variance optimization with specific tilts based on theme expressions.

Rebalancing Methodology

Quarterly Full Optimization

Schedule: Third Friday of March, June, September, December

Process:

1. Update all 13 macro indicators

2. Calculate theme momentums and probabilities

3. Determine scenario probabilities

4. Run portfolio optimization

5. Apply risk minimization

6. Execute trades over 5 days

Monthly Drift Check

Schedule: First Friday of each month

Triggers:

- Any position > 3% drift from target

- Total portfolio drift > 10%

- Theme probability change > 20%

Risk Management

Position Limits

- Maximum single position: 35%

- Maximum sector concentration: 50%

- Minimum cash position: 1%

- Maximum alternatives: 30%

Scenario Risk Limits

- Maximum regret in any scenario: -8%

- Minimum upside capture: 70%

- Maximum correlation to any single factor: 0.7

Macro Environment Monitoring

Current Operational Framework (v3.8 - 13 Indicators)

The portfolio monitors 13 indicators across 4 themes using adaptive MA comparisons (except TIC flows which uses zero boundary).

Comprehensive Indicator Specifications

Theme	Indicator	Calculation Method	Signal Tier	Update Freq	Status	Trigger Rate
USD	DXY Index	200D MA vs 400D MA	Canary	Daily	Pending	TBD
	USD Reserve Share	YoY change < -0.5%	Structural	Quarterly	Pending	TBD
	Yuan SWIFT Share	12M MA vs 36M MA	Primary	Monthly	Pending	TBD
	Central Bank Gold	4Q MA vs 12Q MA	Structural	Quarterly	Pending	TBD
AI	Productivity Growth	2Q MA > 6Q MA	Structural	Quarterly	✅ Calibrated	47.7%
	QQQ/SPY Ratio	50D MA vs 200D MA	Canary	Daily	Pending	TBD
	S&P Net Margins	TTM > 3Y MA + 0.5%	Primary	Quarterly	Pending	TBD
P/E	Forward P/E	1Y MA > 3Y MA	Primary	Weekly	✅ Calibrated	49.4%
	Shiller CAPE	Current vs 20Y MA	Primary	Monthly	Pending	TBD
	Equity Risk Premium	6M MA vs 18M MA	Canary	Daily	Pending	TBD
INTL	ACWX/SPY Relative	30D MA vs 90D MA	Canary	Daily	Pending	TBD
	S&P vs MSCI World	6M relative < -2%	Primary	Weekly	Pending	TBD
	US % of ACWI	12M MA vs 36M MA	Structural	Monthly	Pending	TBD
	TIC Net Flows	12M sum < 0 (fixed)	Structural	2M lag	Pending	TBD

Theme Weight Distribution by Signal Tier

Theme	Canary (30-35%)	Primary (35-50%)	Structural (20-30%)
USD	DXY Index	Yuan SWIFT	Reserves, Gold
AI	QQQ/SPY	Net Margins	Productivity
P/E	Risk Premium	Forward P/E, CAPE	-
INTL	ACWX/SPY	S&P vs World	US %, TIC

Key Changes in v3.8

- **Philosophical Shift**: 12 of 13 indicators now use MA comparisons (only TIC flows uses fixed zero boundary)
- **DXY Duplication Removed**: Eliminated DXY Level to reduce USD/INTL correlation
- **ACWX/SPY Added**: New liquid canary for international momentum

- **All thresholds adaptive**: MA comparisons naturally adjust to regime changes

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Enhanced Transition Probability Framework (v3.7)

Three-Component Model for Regime Change Probability

The framework now incorporates three factors to calculate realistic transition probabilities:

1. **Current State**: Binary determination of which side of MA trigger (determines current scenario)

2. **Momentum**: Rate and direction of change (continuous, -1 to +1 range)

3. **Distance to Trigger**: How far from MA crossing point (continuous, percentage)

Why Distance Matters

Problem with Momentum-Only: An indicator falling from extreme levels (e.g., P/E from 35 to 30) shows "strong momentum toward reversion" but remains far above its trigger (e.g., MA at 22). Without distance consideration, the system assigns high transition probability despite being months or years from actual regime change.

Solution: Physics-based time-to-trigger estimation that realistically models when an indicator might cross its moving average threshold.

Edge Case Guidance

Near-Trigger Oscillation (Distance < 5% of MA)

- Minimum 30% transition probability

- High sensitivity to momentum changes

- Frequent scenario flips expected and acceptable

Strong Momentum, Far from Trigger (Distance > 30%, Momentum > 0.5)

- Capped at 20% probability

- Recognizes improvement but maintains realism

- Prevents premature portfolio adjustments

Weak Momentum, Close to Trigger (Distance < 10%, Momentum < 0.2)

- Medium probability (20-40%)

- Random walk could trigger crossing

- Heightened monitoring warranted

Moving Away from Trigger (Negative momentum relative to trigger)

- Probability reduced by 70%

- Base rate assumptions only

- Requires momentum reversal first

Example Calculation Matrix

Current P/E	MA Trigger	Distance	Momentum	Months to Trigger	Probability
30	22	+36%	-0.5	~36	10%
24	22	+9%	-0.3	~15	15%
23	22	+4.5%	-0.4	~6	40%
22.5	22	+2.3%	-0.2	~6	40%
21	22	-4.5%	+0.3	~8	25%

Backward Compatibility

This enhancement is fully backward compatible. Existing momentum calculations remain unchanged. The distance component acts as a reality check that prevents unrealistic probability estimates for indicators far from their triggers.

Critical Priority Status

This is the #1 priority for IPS development. The provisional trigger specifications above are educated estimates that require immediate validation through historical backtesting. Portfolio performance is directly dependent on accurate scenario identification.

Macro Environment Calibration

Overview

We are undertaking a comprehensive recalibration of all macro environment indicators to validate and refine the provisional 50% trigger thresholds currently in use. Each indicator's moving average period and trigger threshold must be backtested against historical data to ensure proper trigger frequency and signal quality.

Methodology

1. **Base Rate Target**: Each indicator should trigger approximately 50% of the time to create balanced, adaptive scenarios rather than momentum-biased defaults (Decision updated: August 24, 2025)

2. **Cycle Matching**: MA periods must respect the natural rhythm of each economic phenomenon, but prioritize responsiveness given 50% trigger target

3. **Backtesting Requirement**: All changes must be validated with historical data before implementation

4. **Threshold Definition**: Each indicator needs explicit trigger rules (e.g., "exceeds baseline by X%")

Rationale for 50% Base Rate: Rather than treating momentum as "normal" (70% of time with 20% triggers), we now treat all market regimes as equally valid. This creates more balanced scenario probabilities (Momentum ~25%, Neutral ~60%, Defensive ~15%) and enables earlier regime recognition at the cost of more frequent scenario changes.

Calibration Status Summary

Indicator	Current Method	Threshold	Status	Trigger Rate
Productivity Growth	2Q MA > 6Q MA	0%	✅ Calibrated	47.7%
Forward P/E	1Y MA	TBD (~21-22)	Pending	TBD
DXY Index	200-day MA	< 100	Pending	TBD
S&P Net Margins	TTM vs 3Y avg	+0.5%	Pending	TBD
QQQ/SPY Ratio	150-day MA	> 0.85	Pending	TBD
Equity Risk Premium	E/Y - 10Y	< 1.5%	Pending	TBD
USD Reserve Share	YoY change	< -0.5%	Pending	TBD
Shiller CAPE	Current	> 28	Pending	TBD
Yuan SWIFT Share	12M MA	> 2.5%	Pending	TBD
Central Bank Gold	4Q MA	> 50B	Pending	TBD
S&P vs MSCI World	6M relative	< -2%	Pending	TBD
US % of ACWI	12M MA	> 60%	Pending	TBD
TIC Net Flows	12M sum	< 0	Pending	TBD

Future Enhancement: Three-State Scenario Cube Framework

Concept Overview

Evolution from binary (triggered/not triggered) to three-state system for each indicator:

- **-1**: Below normal range (potentially bullish signal)
- **0**: Within normal range
- **+1**: Above normal range (potentially bearish signal)

Implementation Method

For each indicator:

1. Calculate long-term mean and standard deviation

2. Define thresholds using standard deviations:
   - Below (mean - 0.5σ): State = -1 (~30% of observations)
   - Between ±0.5σ: State = 0 (~40% of observations)
   - Above (mean + 0.5σ): State = +1 (~30% of observations)

Benefits Over Binary System

- **Directional Information**: Distinguishes between "too hot" vs "too cold" (e.g., overvalued vs undervalued)

- **Richer Signal Set**: 3^13 possible states vs 2^13, capturing more nuanced market configurations

- **Natural Risk Scaling**: Sum of states creates spectrum from -13 (max bullish) to +13 (max bearish)

- **Pattern Recognition**: Different configurations tell different stories (e.g., recession vs late cycle vs recovery)

Momentum-Based State Transition Framework (Markov Chain Regime Analysis)

The three-state system enables Markov Chain modeling of market regime transitions, where future states depend only on current state and transition probabilities (the Markov property).

Technical Framework:

- **State Space**: 3^13 possible configurations (each indicator in states {-1, 0, +1})

- **Transition Matrix**: Momentum of each indicator determines transition probabilities $P(i,j)$ between states

- **Markov Property**: Next state depends only on current state + momentum, not full history

- **Ergodic Assumption**: System can eventually reach any state from any other state (no absorbing states)

Implementation:

1. **State Identification**: Map current indicator readings to state vector $S(t) \in \{-1,0,1\}^{13}$

2. **Transition Probability Calculation**: Use indicator momentum to estimate $P(S(t+1)|S(t))$

3. **Forward State Distribution**: Calculate probability distribution over reachable states in next k periods

4. **Optimal Allocation**: Weight portfolio based on expected value over probable future states, not current state

Computational Simplification:

- Rather than tracking full $3^{13} \times 3^{13}$ transition matrix (2.5×10^{12} entries)
- Assume independence: $P(S(t+1)|S(t)) \approx \prod P(s\_i(t+1)|s\_i(t))$ for each indicator i
- Reduces to 13 separate 3×3 transition matrices (117 parameters total)
- Focus on highest-probability paths (e.g., 67% of probability mass)

Development Roadmap

1. Complete binary system calibration with 50% triggers (current project)
2. Gather statistical parameters (mean, σ) for all indicators
3. Backtest three-state thresholds
4. Develop pattern recognition rules for common market regimes
5. Test portfolio performance under three-state vs binary framework
6. Implementation target: IPS v5.0 (2026)

Appendices

Appendix A: Security Selection Criteria

- Minimum AUM: $1B
- Maximum expense ratio: 1.0%
- Minimum daily volume: $10M
- Listed on major US exchange

Appendix B: Tax Considerations

- Harvest losses in November-December
- Avoid wash sales across correlated ETFs
- PIMIX distributions require special handling
- Prefer ETFs over mutual funds in taxable accounts

Appendix C: Emergency Protocols

Market Crisis (>20% decline):

- Suspend rebalancing

- Maintain current positions

- Document but don't act on indicator changes

- Resume normal operations after 30 days

Data System Failure:

- Use last known good values

- Apply defensive tilt (+10% bonds)

- Manual calculation backup procedures

- Daily monitoring until resolved

Appendix D: Quarterly Review Template

1. Performance vs benchmarks

2. Scenario prediction accuracy

3. Indicator momentum analysis

4. Risk metrics review

5. Lessons learned

6. Adjustments for next quarter

Appendix E: Trading Execution Framework

- PIMIX: Hold-only (never generate BUY orders)

- PYLD: Primary vehicle for income increases

- VTI/VEA/VWO: Core positions, trade in $1000 increments

- Alternatives: Maintain minimum 1% positions when held

- Use limit orders for positions > $10,000

Appendix F: Data Quality Standards

Green Light (Full Trading):

- At least 12 of 13 indicators fresh

- All 4 themes have 2+ fresh indicators

- No theme fully missing

Yellow Light (Provisional):

- 10-11 indicators fresh

- Document quality issues

- Proceed with caution

Red Light (Trading Halt):

- Fewer than 10 indicators fresh

- Any theme fully missing

- Use carry-forward with defensive tilt

Appendix G: Data Collection Methodology

Dual-Source Approach for Forward P/E

- **Historical Calibration**: Yardeni Research PDF (1979-present)
  - Used for initial threshold calibration

  - Consensus-based (I/B/E/S via Refinitiv)

  - Monthly historical data points

- **Monthly Updates**: FactSet Earnings Insight
  - Weekly reports, use month-end value

  - Professional consensus estimates

  - More frequent updates available

- **Note**: ~1-2 point discrepancy may exist between sources due to methodology differences

Data Quality Assurance

- Document source for each data point

- Note any methodology changes

- Validate against multiple sources when possible

- Maintain version control for data updates

- Flag any significant discrepancies between sources

Priority Data Sources by Indicator

1. **Productivity**: BLS (primary), FRED (backup)

2. **Forward P/E**: Yardeni (historical), FactSet (ongoing)

3. **DXY**: FRED (authoritative)

4. **CAPE**: Shiller website (original source)

5. **Margins**: S&P/Compustat (ideal), estimated if needed

Appendix H: Enhanced Transition Probability Methodology (v3.7/v3.8)

Overview

The portfolio uses a three-component model to calculate realistic transition probabilities:

1. **Momentum**: Rate and direction of indicator change

2. **Distance**: How far indicator is from MA trigger

3. **Time**: Physics-based estimate of crossing time

Enhanced Calculation

```python
```

```python
def calculate_enhanced_transition_probability(indicator):
    # Get position relative to MA trigger (from IPS 3.7 MA specifications)
    current_value = indicator.current
    ma_trigger = indicator.moving_average
    distance_to_trigger = (current_value - ma_trigger) / ma_trigger  # Percentage distance

    # Calculate existing momentum
    momentum = calculate_momentum(indicator)  # -1 to +1 range from current methodology

    # Physics-based time estimate
    # Assumes momentum of 1.0 = ~2% monthly change
    if abs(momentum) > 0.01:
        months_to_trigger = abs(distance_to_trigger) / (abs(momentum) * 0.02)
    else:
        months_to_trigger = 999  # Effectively infinite for near-zero momentum

    # Time-based probability decay function
    if months_to_trigger < 3:
        base_probability = 0.70  # Likely within quarter
    elif months_to_trigger < 6:
        base_probability = 0.40  # Likely within 2 quarters
    elif months_to_trigger < 12:
        base_probability = 0.20  # Possible within year
    elif months_to_trigger < 24:
        base_probability = 0.10  # Unlikely but possible
    else:
        base_probability = 0.05  # Base rate for distant events

    # Direction adjustment
    moving_toward_trigger = (distance_to_trigger > 0 and momentum < 0) or \
                    (distance_to_trigger < 0 and momentum > 0)

    if moving_toward_trigger:
        final_probability = base_probability
    else:
        # Moving away from trigger - substantially reduce probability
        final_probability = base_probability * 0.3

    # Boundary conditions
    # Near trigger override - if within 5% of MA, minimum 30% probability
    if abs(distance_to_trigger) < 0.05:
        final_probability = max(final_probability, 0.30)
```

```python
        # Far from trigger cap - if beyond 30% from MA, maximum 20% probability
        if abs(distance_to_trigger) > 0.30:
            final_probability = min(final_probability, 0.20)

        # Extreme momentum override - very strong momentum adds probability
        if abs(momentum) > 0.8 and moving_toward_trigger:
            final_probability = min(0.95, final_probability + 0.20)

        return min(0.95, max(0.05, final_probability))
```

Theme Probability Aggregation

```python
python

def calculate_theme_probability_enhanced(theme_indicators):
    """Aggregate indicator probabilities to theme level"""
    weighted_probabilities = []

    for indicator, weight in theme_indicators.items():
        # Calculate enhanced probability for each indicator
        prob = calculate_enhanced_transition_probability(indicator)
        weighted_probabilities.append(prob * weight)

    # Weighted average of enhanced probabilities
    theme_probability = sum(weighted_probabilities) / sum(weights)

    return max(0.05, min(0.95, theme_probability))
```

Validation Requirements

1. **Near-Trigger Validation**: Indicators within 5% of MA should show 30%+ probability

2. **Distant Indicator Check**: Indicators beyond 30% from MA should show <20% probability

3. **Time Estimate Accuracy**: Historical crossing times should match predictions ±50%

4. **Momentum Direction**: Verify probability drops 70% when moving away from trigger

Migration from v3.6

Existing implementations should:

1. Add distance calculation to current momentum framework

2. Implement time-to-trigger physics model

3. Apply boundary conditions for extreme cases

4. Maintain backward compatibility with pure momentum fallback

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Version History

Version 3.9 (August 25, 2025, 11:30 AM)

- **MAJOR PHILOSOPHICAL SHIFT**: Converted 12 of 13 indicators to MA comparisons (only TIC flows uses fixed threshold)

- **Universal Adaptivity**: Indicators now self-adjust to regime changes, maintaining ~50% frequency naturally

- **Calibrations Complete**:
  - Forward P/E: 1Y MA vs 3Y MA (49.4% trigger rate)
  - Productivity: 2Q MA vs 6Q MA (47.7% trigger rate)

- **Signal Liquidity Framework**: Three-tier system (Canary/Primary/Structural) for balanced detection

- **Indicator Changes**:
  - Removed DXY Level (redundant with DXY Index)
  - Added ACWX/SPY as international canary indicator
  - Reduced from 14 to 13 total indicators

- **MA Comparison Conversions**:
  - DXY Index: 200D vs 400D MA
  - QQQ/SPY: 50D vs 200D MA
  - Yuan SWIFT: 12M vs 36M MA
  - Central Bank Gold: 4Q vs 12Q MA
  - Equity Risk Premium: 6M vs 18M MA
  - CAPE: Current vs 20Y MA (converted from > 28)
  - US % ACWI: 12M vs 36M MA (converted from > 60%)

- **Maintained**: Distance-to-trigger framework from v3.7

Version 3.8 (August 25, 2025, 10:30 AM)

- Initial framework for MA comparisons
- Preliminary signal liquidity tiers
- Forward P/E and Productivity calibration documentation

Version 3.7 (August 25, 2025, 9:00 AM)

- **Data Collection Enhancement**: Implemented dual-source methodology for Forward P/E indicator

- **Productivity Calibration Complete**: Confirmed 2Q MA > 6Q MA threshold (47.7% trigger rate)

- **Established Data Framework**: Yardeni Research (historical) + FactSet (ongoing) for P/E data

- **Critical Enhancement**: Added distance-to-trigger component to transition probability calculations

- **Problem Solved**: Fixed "context blindness" where strong momentum ignored actual distance from triggers

- **New Framework**: Three-component model (Current State, Momentum, Distance) for realistic probabilities

- **Implementation**: Enhanced calculation in Appendix H with physics-based time-to-trigger estimates

- **Testing Requirements**: Validate near-trigger (>30% prob), distant (<20% prob), and time estimates

Version 3.6 (August 24, 2025)

- **Added complete provisional indicator specifications** currently in use by Tracker

- **Elevated calibration to Priority #1** with accelerated 4-week timeline

- Documented all 14 indicator trigger thresholds targeting 50% frequency

- Major philosophical shift: Changed from 20% to 50% trigger targets for all indicators

- Rationale: Creates balanced adaptive scenarios (25% momentum/60% neutral/15% defensive) vs momentum-biased (68%/31%/1%)

- Documented methodology for matching MA periods to natural cycle lengths

- Completed initial analysis for productivity growth and forward P/E (needs revision for 50% target)

- Added three-state Markov Chain framework as future enhancement

- Established framework for systematic indicator optimization

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End of Investment Policy Statement v3.9