The Bifurcation Index™

BFX — Composite Economic Divergence Indicator

Index Range	0 – 100	50 = 2008–2019 pre-pandemic baseline
Coverage	January 2008 – Present	Weekly publication
Components	15 analytical components	33 FRED data series
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Abstract

The Bifurcation Index (BFX) is a proprietary composite economic indicator that quantifies the structural divergence between upper-income and lower-income economic realities in the United States. The index synthesizes **15 analytical components derived from 33 FRED data series** across five equally-weighted pillars — Consumer Spending, Labor Market, Housing, Financial Assets, and Consumer Sentiment — into a single interpretable score from 0 to 100. A reading of 50 represents the pre-pandemic baseline established over the January 2008 – December 2019 reference period.

All component series are stationary by design: ratios, YoY growth rates, bounded rates, or detrended via ratio to a 120-month trailing moving average. A single five-step pipeline applies a 3-month centered moving average followed by fixed-baseline z-scoring to convert each component to a 0–100 scale. Published BFX values are the direct equal-weighted average of the five pillar scores — final on the date of publication with no composite-level smoothing.

At publication, the BFX reads **57** (Slightly Above Baseline), with pillar scores of: Consumer Spending 81, Labor Market 39, Housing 50, Financial Assets 55, Consumer Sentiment 61. Empirical validation on the constructed backtest demonstrates statistically significant leading relationships with consumer sector relative performance, credit card delinquency trends, sector return dispersion, and consumer sentiment — all in the expected direction. The 2008–2026 historical series is a constructed backtest; live publication commenced March 2026.

Introduction & Motivation

A persistent challenge in macroeconomic analysis is the tendency of aggregate indicators to obscure distributional reality. Headline GDP growth, the unemployment rate, and consumer confidence surveys report economy-wide averages that may simultaneously reflect robust expansion at the top of the income distribution and material contraction at the bottom. This is structural: aggregate indicators summarize; they do not detect divergence.

The 2020–2023 period rendered this limitation unusually visible. Equity markets recovered in weeks from the COVID-19 shock while unemployment among service workers persisted for years. Federal Reserve officials, including Federal Reserve Chairman Jerome Powell, explicitly acknowledged the 'K-shaped recovery' — upper-income households rebounded sharply while lower-income households recovered slowly or not at all. Stimulus transfers temporarily compressed income divergence while asset price inflation simultaneously widened wealth divergence.

The BFX operationalizes this observation: a single composite number that tracks the K-shape through time, comparable across historical episodes, and publishable with the methodological rigor required for institutional use. The objective is a transparent, reproducible measure of economic divergence that informs portfolio construction, policy analysis, and economic commentary — not a trading signal or investment recommendation.

The index is built entirely on free, publicly available data from the U.S. Federal Reserve (FRED), Bureau of Labor Statistics (BLS), Bureau of Economic Analysis (BEA), S&P Dow Jones Indices / Cotality (formerly CoreLogic) (Case-Shiller, via FRED), and the Baker-Bloom-Davis EPU project (via FRED). Any researcher with a FRED API key and the documented software environment can reconstruct the full historical series and verify every component to within floating-point precision.

The BFX occupies a distinct position relative to existing economic indicators. The Chicago Fed National Financial Conditions Index (NFCI), the St. Louis Fed Financial Stress Index (STLFSI), and real-time inflation measures such as the Truflation index each measure the *level or volatility* of economic conditions economy-wide. None are specifically designed to quantify the divergence between upper-income and lower-income economic realities over time. The NFCI tells you whether financial conditions are tight or loose in aggregate. Truflation tells you whether prices are rising faster than official CPI. The BFX tells you whether the economy is bifurcating — whether asset owners and wage earners are experiencing materially different economic realities. These are complementary instruments, not competing ones.

Index Architecture Overview

Design Philosophy

Four architectural principles govern all design decisions in the BFX:

- **Directional consistency.** Every component is oriented so that a higher score indicates greater bifurcation. Components where lower values indicate more divergence are negated before normalization, ensuring the composite is interpretable without tracking individual sign conventions.

- **Fixed reference frame.** The 2008–2019 baseline is frozen at construction. Means and standard deviations are computed once and never updated, preventing retrospective normalization drift — the failure mode in which rolling-window approaches absorb post-crisis extremes into the baseline and erase the signal over time.

- **Stationarity requirement.** Every component input must be stationary over the reference window — either inherently (ratios, spreads, bounded rates) or by explicit transformation (YoY growth rates, ratio-to-trend detrending). Non-stationary series mechanically drift independent of actual bifurcation. This is explicitly prohibited.

- **Full reproducibility.** Every FRED series ID, every transformation step, and every parameter is specified with precision sufficient to reproduce any historical reading to within floating-point precision.

Five-Pillar Structure

The BFX is organized into five pillars. Pillars 1–4 use strict equal weighting within the pillar. Pillar 5 (Sentiment) uses documented differential weighting described in Section 9. All five pillars are equally weighted in the composite.

Pillar	Weight	Components	Series	Domain
1. Consumer Spending	20%	2	9	Discretionary/necessity basket; PCE composition YoY
2. Labor Market	20%	3	6	Wage levels, unemployment spread, job quality
3. Housing	20%	3	11	CS tier spread, ownership rate, affordability
4. Financial Assets	20%	4	4	Equity trend, credit growth, savings, delinquency
5. Consumer Sentiment	20%	3	3	Michigan ICS, financial conditions gap, EPU
BFX Composite	100%	15	33	Equal-weighted average of five pillars

Score Summary at Publication

The following table reflects BFX v5.2 output at initial publication. Current readings are published weekly and available at bifurcationanalytics.com.

Pillar	Score	Interpretation
Consumer Spending	81	Above Baseline — discretionary basket elevated; PCE services YoY acceleration above pre-pandemic norm
Labor Market	39	Below Baseline — post-pandemic wage compression; low-wage gains compressed the wage ratio
Housing	50	At Baseline — CS tier spread, homeownership, and shelter-wage gap near 2008–2019 average
Financial Assets	55	Slightly Above Baseline — equity above 10-year trend; revolving credit near norm; savings compressed
Consumer Sentiment	61	Moderately Elevated — sentiment below baseline; financial conditions gap above norm
BFX Composite	57	Slightly Above Baseline — above-baseline spending offset by below-baseline labor

Scores rounded to nearest integer. Internal calculations use full floating-point precision. The Labor pillar at 39 reflects genuine post-pandemic wage compression — a real signal, not a methodological anomaly.

Normalization & Computation Methodology

Component Scoring Pipeline

Every BFX component passes through an identical five-step scoring pipeline, implemented in *src/utils/normalization.py: score_component()*. The steps are applied in strict sequence.

```
Step 1: raw_series.dropna() → resample to monthly frequency Prices/levels: last
observation of month Rates/indices/flows: mean of all observations within month
Step 2: smooth(series, window=3, center=True) 3-month centered moving average
applied to raw monthly values Step 3: if invert: series = −1 × series For
components where LOWER value = MORE bifurcation Step 4: z = (series − μ_ref) /
σ_ref μ_ref, σ_ref computed from the smoothed series over [2008-01, 2019-12]
Step 5: score = clip(50 + 15 × z, 0, 100)
```

Inversion (Step 3) occurs after smoothing but before z-scoring. Baseline statistics are therefore computed on the smoothed, inverted series. The centered 3-month average for the first baseline month (2008-01) uses December 2007 as the prior observation, requiring one month of pre-window data.

Fixed Baseline Z-Score

The baseline window spans January 2008 through December 2019 — 144 months. This period covers peak unemployment (10.0% on revised data, October 2009) through the pre-pandemic trough (3.5%, September 2019), encompassing multiple Federal Reserve policy regimes from the zero lower bound through rate normalization.

```
z_t = ( ■x_t − μ_ref ) / σ_ref
```

```
μ_ref = mean( ■x_t ) for t ∈ [2008-01, 2019-12] (sample mean on smoothed series)
σ_ref = std( ■x_t ) for t ∈ [2008-01, 2019-12] (pandas std, ddof=1) ■x_t =
three-month centered moving average of raw series
```

```
S_t = clip( 50 + 15 × z_t , 0, 100 )
```

The scale factor of 15 was set analytically: display bounds [0, 100] correspond to ±3.33 standard deviations from baseline. For approximately normally distributed components, fewer than 0.1% of baseline observations are clipped. This parameter was fixed before examining post-2019 data and has not been optimized against any outcome variable.

Smoothing — Single Stage (Component Level Only)

BFX v5.2 applies smoothing at one level only: the component level. A previous two-stage design included a second 2-month centered moving average at the composite level. This was removed because centered smoothing at the composite level caused each new monthly publication to retroactively revise the prior month's published value — an undisclosed revision mechanism incompatible with the stated revision policy. Stage 1 component-level smoothing already reduces noise sufficiently.

```
Component smoothing: ■x_t = ( x_{t−1} + x_t + x_{t+1} ) / 3
```

Published BFX values are the direct weighted average of pillar scores. A value published on Friday is final and will not change in subsequent publications unless a FRED data revision exceeds the documented 1-point threshold (Section 10.4).

Composite Construction & Data Alignment

```
Pillar_k = (1 / n_k) × Σ_i S_{k,i}   BFX_t = (1 / 5) × Σ_{k=1}^{5} Pillar_k
```

Different pillars have different publication lags. To prevent a pillar from being driven to neutral (50) by a publication lag rather than genuine data, the composite applies forward-fill with a maximum of 2 months (*df.ffill(limit=2)*) to pillar scores before computing the weighted average. This is data alignment, not smoothing.

Missing Data Policy

Two distinct missing-data scenarios are handled separately. Scenario A: a component exists in the pipeline but has NaN for a given month — handled by *fillna(50)* (neutral imputation). Scenario B: a component fails completely (API error, series discontinued) — handled by contributing 50 × weight to the pillar average, preserving the equal-weighting denominator. Both scenarios pull toward baseline midpoint (50) rather than toward extremes, and neither redistributes weight to surviving components.

Quarterly Data Handling

Three series are published quarterly: RHORUSQ156N (Homeownership Rate), DRCCLACBS (Credit Card Delinquency Rate), and the context-only Fed DFA wealth series. Quarterly values are converted to monthly using forward-fill with a maximum of 3 periods (*ffill(limit=3)*). The Q1 reading is held constant for January, February, and March until Q2 is available. This is not linear interpolation — it reflects actual data available at each monthly computation point.

Forward-fill behavior for monthly series: The *to_monthly()* resampling function applies *ffill(limit=3)* to all series passed through it, including monthly series. For monthly inputs, this handles publication lags and API gaps of up to 3 months. The behavior is data alignment, not imputation — it reflects the last known value, consistent with the composite-level *ffill(limit=2)* described in Section 4.4. In v5.2, *to_monthly()* accepts an explicit *ffill_limit* parameter that auto-detects the appropriate limit based on series frequency (monthly → limit=1; quarterly → limit=3).

Stationarity Requirement & Enforcement

Transformation Class	Stationarity Rationale	BFX Examples
Ratio of co-trending series	Shared trend cancels in numerator/denominator. Mean-reverting around a structural level.	Discretionary/necessity retail; wage level ratio; job quality ratio (inverted)
YoY% change of ratio	First-differencing removes unit root from a trending level ratio. Measures acceleration of structural shift.	PCE services/goods YoY change (Component 1.2)

Transformation Class	Stationarity Rationale	BFX Examples
YoY growth rate spread	Spread of two YoY series — both stationary, difference stationary.	Case-Shiller tier spread; shelter CPI vs. wage growth
Bounded rate (level)	Mathematically bounded [0, 100%] and economically mean-reverting.	Homeownership; savings rate; delinquency; unemployment spread
Detrended ratio (equity)	NASDAQ / 120-month trailing MA bounded around 1.0 by construction. Shiller-style detrending.	Equity detrended (Component 4.1)
Level with structural mean-reversion	EPU has structural tendency to revert; z-score measures departure from pre-pandemic norm.	Economic Policy Uncertainty index

Theoretical Justification for Fixed Baseline

The 2008–2019 reference period represents the post-GFC, pre-pandemic steady state. It encompasses a complete business cycle from peak unemployment (10.0% on revised data, October 2009) through the pre-pandemic trough (3.5%, September 2019). A BFX reading of 50 definitionally represents the average bifurcation observed during this regime — a defensible and intuitive anchor.

A rolling z-score baseline would gradually absorb post-pandemic divergence as it accumulates into the window, eventually erasing the signal. The fixed baseline prevents this: the post-pandemic divergence remains permanently visible, measured against the pre-pandemic world.

Pillar 1 — Consumer Spending

Component 1.1 — Discretionary / Necessity Retail Sales Ratio
Formula: (RSFSDP + RSFHFS + RSEAS) / (RSGCS + RSGMS + RSHPCS)

Role	FRED Series	Description	NAICS Scope
Disc. numerator	RSFSDP	Food Services & Drinking Places	722: Restaurants, bars
Disc. numerator	RSFHFS	Furniture & Home Furnishings	442: Home furnishings stores
Disc. numerator	RSEAS	Electronics & Appliance Stores	443: Apple Stores, Best Buy
Necessity denom.	RSGCS	Grocery Stores	4451: Supermarkets
Necessity denom.	RSGMS	General Merchandise Stores	452: Walmart, Costco, Target
Necessity denom.	RSHPCS	Health & Personal Care Stores	446: Pharmacies

- **Direction:** Higher ratio = discretionary outpacing necessities = more bifurcation. No inversion.
- **Label note:** 'Discretionary/Necessity' rather than 'Luxury/Necessity.' RSFSDP (NAICS 722) includes limited-service restaurants (~45% of category). 'Discretionary' accurately reflects the income-elasticity of all numerator categories per CEX data.
- **Stationarity:** All six series share common inflation and population trends. The ratio removes the shared trend and is mean-reverting.

Component 1.2 — PCE Services/Goods Ratio — YoY Change
Formula: YoY%(PCES / (PCEDG + PCEND))

Role	FRED Series	Description	Frequency
Numerator	PCES	PCE: Services (BEA)	Monthly, SA, billions $
Denominator	PCEDG	PCE: Durable Goods (BEA)	Monthly, SA, billions $
Denominator	PCEND	PCE: Nondurable Goods (BEA)	Monthly, SA, billions $

- **Why YoY change, not level:** The services/goods ratio has been rising for six decades (0.89 in 1960; 2.57 in 2023). The level is non-stationary. The YoY change measures whether the services shift is accelerating above pre-pandemic norm — stationary and economically meaningful.
- **Known limitation:** PCES includes healthcare (~25%) and housing services (~18%) that are not purely upper-income discretionary. An ideal replacement would use PCE sub-components for discretionary services only. Documented as a future enhancement.

Pillar 2 — Labor Market

All three components are ratios or spreads — stationary by construction. The pillar score of 39 reflects genuine post-pandemic wage compression: low-wage workers gained faster than high-wage workers in 2021–2023. The index reports this accurately — it is a feature, not a defect.

Component 2.1 — Wage Level Ratio (Financial Activities / Leisure & Hospitality)

Role	FRED Series	Description	Scope
Numerator	CES5500000003	Avg Hourly Earnings: Financial Activities (P&NS)	NAICS 52+53
Denominator	CES7000000003	Avg Hourly Earnings: Leisure & Hospitality (P&NS)	NAICS 71+72

- **Direction:** Higher ratio = wider structural pay gap = more bifurcation.
- **Series scope:** CES55 = Financial Activities supersector (Finance & Insurance + Real Estate, NAICS 52+53). Represents the highest-compensated major BLS supersector. Series ending ...003 =

Production & Non-Supervisory workers (~80% of employment) — a direct measure of structural compensation inequality.

- **Post-2021 note:** The wage ratio declined from approximately 2.21 (2016) to 1.91 (2023), driven by disproportionate low-wage gains in Leisure & Hospitality. This compression is measured correctly — it is a genuine signal of reduced wage divergence, not a methodology artifact.

Component 2.2 — Education-Based Unemployment Spread

Series	FRED ID	Description	Frequency
Upper	LNS14027659	Unemployment Rate: Less than HS Diploma, 25+	Monthly, SA, %
Lower	LNS14027662	Unemployment Rate: Bachelor's Degree+, 25+	Monthly, SA, %

Formula: Spread = LNS14027659 − LNS14027662. Higher spread = wider educational unemployment gap = more bifurcation. Both series are bounded; their difference is stationary.

Component 2.3 — Job Quality Ratio (Financial / Leisure Employment, Inverted)

Role	FRED Series	Description	Frequency
Numerator	USFIRE	All Employees: Financial Activities	Monthly, SA, thousands
Denominator	USLAH	All Employees: Leisure & Hospitality	Monthly, SA, thousands

- **Direction (INVERTED):** Lower ratio = Leisure growing faster than Finance = economy adding low-wage jobs disproportionately = MORE bifurcation. Inverted before z-scoring.

Pillar 3 — Housing

Component 3.1 — Case-Shiller High / Low Tier YoY Growth Spread

Metro	High Tier	Low Tier	Source
San Francisco	SFXRHTSA	SFXRLTSA	S&P Dow Jones / Cotality (formerly CoreLogic), SA, monthly
Los Angeles	LXXRHTSA	LXXRLTSA	S&P Dow Jones / Cotality (formerly CoreLogic), SA, monthly
New York	NYXRHTSA	NYXRLTSA	S&P Dow Jones / Cotality (formerly CoreLogic), SA, monthly
Chicago	CHXRHTSA	CHXRLTSA	S&P Dow Jones / Cotality (formerly CoreLogic), SA, monthly

- **Formula:** For each metro, compute (High Tier YoY% – Low Tier YoY%). Average across available metros.
- **Series note:** SA city-specific series used (not NSA 10-city composite) to avoid seasonal noise at monthly frequency.

Component 3.2 — Homeownership Rate (Inverted)

FRED Series	RHORUSQ156N (Homeownership Rate for the United States, SA, quarterly)
Handling	Quarterly → monthly via ffill(limit=3). Inverted before z-scoring.
Direction	Declining ownership = lower-income households priced out = MORE bifurcation.
Stationarity	Bounded percentage rate, mean-reverting. Stationary.

Component 3.3 — Housing CPI YoY minus Wage Growth YoY

Role	FRED Series	Description	Frequency
Housing CPI	CPIHOSSL	CPI: Housing, SA (1982-84=100)	Monthly, SA
Wage growth	CES0500000003	Avg Hourly Earnings: Total Private (P&NS)	Monthly, SA

Formula: Spread = YoY%(CPIHOSSL) − YoY%(CES0500000003). When housing costs outpace wages, lower-income renters face a deteriorating affordability squeeze while higher-income owners benefit from appreciating asset values. Higher spread = more bifurcation.

CPIHOSSL is the CPI Housing major component, which includes shelter (~45%), fuels & utilities (~8%), and household furnishings (~6%). The narrower shelter sub-index (CUSR0000SAH1) is an alternative; CPIHOSSL is preferred for its monthly SA availability back to 1967 and broader coverage of housing-related cost burdens faced by lower-income households.

Pillar 4 — Financial Assets

Component 4.1 — Equity Market Detrended (NASDAQ / 120-Month Trailing MA)

FRED Series	NASDAQCOM (NASDAQ Composite Index, daily → monthly last-of-month)
Transformation	equity_monthly / rolling_mean(equity_monthly, window=120, min_periods=120)
Detrend window	120 months (10 years) — Shiller-style. Requires data from 1995-01-01 for the MA warmup to complete before the 2008-01 baseline opens.
FRED note	FRED removed all Wilshire data June 2024. SP500/DJIA carry only ~10 years of daily history. NASDAQCOM has data from 1971 — the only FRED equity series with full 2008–2019 baseline coverage after a 120-month warmup.
Direction	Ratio > 1.0 = market above 10-year trend = wealth concentration increasing = MORE bifurcation.
Stationarity	Ratio to own trend is bounded and mean-reverting around 1.0 by construction.

Ownership rationale	The Federal Reserve DFA (2023) documents the top 10% of households own ~93% of corporate equities. This is the qualitative rationale for including equity — not a mathematical transformation. Any constant ownership scalar cancels algebraically in z-scoring.

Replication note: EQUITY_DATA_START = '1995-01-01' in settings.py. Any replication attempt starting from DATA_START_DATE = '2006-01-01' will fail — the 120-month MA cannot be computed for 2008–2017 from 2006 data.

Component 4.2 — Revolving Credit YoY Growth

FRED Series	REVOLSL (Revolving Consumer Credit Outstanding, SA, billions $)
Formula	YoY% = (REVOLSL_t − REVOLSL_{t−12}) / REVOLSL_{t−12} × 100
Direction	Higher credit growth = more lower-income leveraging = MORE bifurcation.
Stationarity	YoY% removes unit root. Bounded in practice by credit availability.

Component 4.3 — Personal Saving Rate (Inverted)

FRED Series	PSAVERT (Personal Saving Rate, SA, %)
Direction	Lower savings = less financial buffer = MORE bifurcation. Inverted before z-scoring.
Stationarity	Bounded rate (0–35%), mean-reverting. Clearly stationary.

Component 4.4 — Credit Card Delinquency Rate

FRED Series	DRCCLACBS (Delinquency Rate on Credit Card Loans, All Commercial Banks, SA, %)
Handling	Quarterly → monthly via ffill(limit=3) inside to_monthly(). Level; no transformation.
Direction	Higher delinquency = lower-income financial stress = MORE bifurcation.
Stationarity	Bounded quarterly rate, mean-reverting. Stationary.

Pillar 5 — Consumer Sentiment

The Consumer Sentiment pillar captures bifurcation in perceived economic conditions and policy uncertainty. **This is the only pillar with non-equal internal weights.**

Internal Weighting — Pillar 5

Component	Raw Weight	Normalised (current)	Normalised (upgrade)
Michigan inverted ICS (current)	0.35	38.9%	N/A

Component	Raw Weight	Normalised (current)	Normalised (upgrade)
Michigan ICC–ICS spread (upgrade)	0.45	N/A	45.0%
NFCI vs. Sentiment gap	0.35	38.9%	35.0%
Economic Policy Uncertainty	0.20	22.2%	20.0%

Michigan receives higher weight as the most direct proxy for lower-income sentiment experience. EPU receives lower weight as a policy-domain measure. When Michigan ICC becomes available, weights update as shown.

Component 5.1 — Michigan Consumer Sentiment (Inverted)

FRED Series	UMCSENT (University of Michigan Consumer Sentiment Index, monthly, NSA)
Transformation	Inverted (Step 3: series = −1 × UMCSENT) before z-scoring.
Direction	Lower headline sentiment = more Main St stress = MORE bifurcation.
Upgrade path	Income-disaggregated Current Conditions Index (ICC) — requires University of Michigan subscription. When acquired, Component 5.1 upgrades to ICC–ICS spread.

UMCSENT1 on FRED is the pre-1978 historical version of the headline index, NOT the Current Conditions sub-index. Fetching UMCSENT1 returns zero post-1978 observations. The system correctly detects this and falls back to inverted headline UMCSENT. UMCSENT appears in both Component 5.1 (directly) and Component 5.2 (as z_sent). Effective UMCSENT exposure in Pillar 5 ranges 38.9%–77.8% depending on market conditions.

Component 5.2 — Financial Conditions vs. Sentiment Gap (6-Step Specification)

```
Step 1: NFCI_weekly → NFCI_monthly = mean of all weekly observations in calendar
month Step 2: NFCI_inverted = -1.0 × NFCI_monthly [NFCI < 0 = loose = good for
asset holders; inverted: positive = loose = bifurcation] Step 3: z_nfci =
fixed_baseline_zscore(NFCI_inverted) [2008-01 to 2019-12 baseline] Step 4:
z_sent = fixed_baseline_zscore(UMCSENT_monthly) [UMCSENT NOT inverted here —
z_sent high when sentiment strong] Step 5: gap = z_nfci - z_sent [Positive:
financial conditions loose, sentiment weak = Wall St / Main St divergence] Step
6: score = clip(50 + 15 × smooth(gap, 3), 0, 100)
```

Empirical scale: The gap is the difference of two z-scores. Empirically measured from the v5.2 pipeline: $r = 0.608$ between z_nfci and z_sent over 2008–2019, resulting in std(gap) = 0.885 and an effective scale factor of 15/0.885 = **16.9** (vs. 15.0 for single-z-score components). This component is slightly more sensitive than other components. The magnitude is a modest effect and is fully transparent.

Smoothing note: UMCSENT in Step 4 is z-scored directly without pre-smoothing; smoothing is applied to the gap in Step 6. This differs from Component 5.1 where UMCSENT is smoothed prior to z-scoring via the standard score_component() pipeline. Gap-level smoothing achieves functionally equivalent noise reduction for the composite sentiment signal.

Component 5.3 — Economic Policy Uncertainty Index

Source	Baker, Bloom & Davis (2016). NBER Working Paper 21633. Via FRED.
FRED Series	USEPUINDXD (US Economic Policy Uncertainty Index, daily → monthly mean)
Direction	Higher uncertainty = MORE bifurcation. Lower-income households are more exposed to policy volatility and have less buffer to absorb policy-driven shocks.
Citation	Baker, S.R., Bloom, N., & Davis, S.J. (2016). Measuring economic policy uncertainty. Quarterly Journal of Economics, 131(4), 1593–1636. https://doi.org/10.1093/qje/qjw024

Data Governance & Reproducibility

Complete FRED Series Registry

All 33 scored FRED series documented below. An additional 3 series are fetched but not scored: WFRBST01134 and WFRBSN40188 (wealth context); UMCSENT1 (returns empty). All series verified on FRED, March 2026.

Series ID	Description	Pillar / Role	Freq.	Adj.
RSFSDP	Food Services & Drinking Places	P1: Disc. numerator	Mo.	SA
RSFHFS	Furniture & Home Furnishings	P1: Disc. numerator	Mo.	SA
RSEAS	Electronics & Appliance Stores	P1: Disc. numerator	Mo.	SA
RSGCS	Grocery Stores	P1: Necessity denom.	Mo.	SA
RSGMS	General Merchandise Stores	P1: Necessity denom.	Mo.	SA
RSHPCS	Health & Personal Care Stores	P1: Necessity denom.	Mo.	SA
PCES	PCE: Services	P1: PCE YoY num.	Mo.	SA
PCEDG	PCE: Durable Goods	P1: PCE YoY denom.	Mo.	SA
PCEND	PCE: Nondurable Goods	P1: PCE YoY denom.	Mo.	SA
CES5500000003	Avg Hourly Earnings: Financial Activities (P&NS;)	P2: Wage num.	Mo.	SA
CES7000000003	Avg Hourly Earnings: Leisure & Hospitality (P&NS;)	P2: Wage denom.	Mo.	SA
LNS14027659	Unemployment Rate: Less than HS Diploma, 25+	P2: Unemp. upper	Mo.	SA
LNS14027662	Unemployment Rate: Bachelor's Degree+, 25+	P2: Unemp. lower	Mo.	SA

Series ID	Description	Pillar / Role	Freq.	Adj.
USFIRE	All Employees: Financial Activities	P2: Job qual. (inv.)	Mo.	SA
USLAH	All Employees: Leisure & Hospitality	P2: Job qual. denom.	Mo.	SA
SFXRHTSA	Case-Shiller: San Francisco High Tier	P3: CS tier SF	Mo.	SA
SFXRLTSA	Case-Shiller: San Francisco Low Tier	P3: CS tier SF	Mo.	SA
LXXRHTSA	Case-Shiller: Los Angeles High Tier	P3: CS tier LA	Mo.	SA
LXXRLTSA	Case-Shiller: Los Angeles Low Tier	P3: CS tier LA	Mo.	SA
NYXRHTSA	Case-Shiller: New York High Tier	P3: CS tier NY	Mo.	SA
NYXRLTSA	Case-Shiller: New York Low Tier	P3: CS tier NY	Mo.	SA
CHXRHTSA	Case-Shiller: Chicago High Tier	P3: CS tier CHI	Mo.	SA
CHXRLTSA	Case-Shiller: Chicago Low Tier	P3: CS tier CHI	Mo.	SA
RHORUSQ156N	U.S. Homeownership Rate	P3: Homeownership	Qtr.	SA
CPIHOSSL	CPI: Housing	P3: Housing CPI	Mo.	SA
CES0500000003	Avg Hourly Earnings: Total Private (P&NS;)	P3: Wage YoY	Mo.	SA
NASDAQCOM	NASDAQ Composite Index	P4: Equity detrended	Daily→Mo.	NSA
REVOLSL	Revolving Consumer Credit Outstanding	P4: Credit YoY	Mo.	SA
PSAVERT	Personal Saving Rate	P4: Savings (inv.)	Mo.	SA
DRCCLACBS	Delinquency Rate: Credit Card Loans	P4: Delinquency	Qtr.	SA
UMCSENT	U of Michigan Consumer Sentiment (ICS)	P5: Michigan + gap	Mo.	NSA
NFCI	Chicago Fed National Financial Conditions Index	P5: NFCI gap	Wkly→Mo.	n/a
USEPUINDXD	Economic Policy Uncertainty Index (US)	P5: EPU	Daily→Mo.	n/a

Software Environment & Test Suite

Package	Min. Version	Purpose
Python	≥ 3.7	Core language (from __future__ import annotations enables type hints on Python 3.7+)
fredapi	≥ 0.5.2	FRED API client
pandas	≥ 2.0.0	Core data manipulation
numpy	≥ 1.24.0	Numerical operations
scipy	≥ 1.10.0	Statistical utilities
matplotlib	≥ 3.7.0	Chart generation
python-dotenv	≥ 1.0.0	Environment variable management

```
Install: pip install -r requirements.txt Run: python main.py Test: python
test_pipeline.py (7 smoke tests, no FRED key required)
```

NASDAQCOM requires data from EQUITY_DATA_START = '1995-01-01' for the 120-month trailing MA warmup. Any replication attempt must pull NASDAQCOM starting from 1995. All other series can be pulled from DATA_START_DATE = '2006-01-01'.

Update Protocol

The BFX is computed and published weekly on Friday after U.S. market close. Each run pulls the latest available data for all 36 series via the FRED API, recomputes all 15 components using the frozen baseline parameters, and generates headline, pillar, and social media chart exports.

Data Release	Source	Typical Release	Affected Pillar
Employment Situation	BLS	First Friday of month	Labor (P2)
CPI	BLS	~13th of following month	Housing (P3)
Advance Retail Sales	Census	~17th of following month	Spending (P1)
PCE / Personal Income	BEA	Last Friday of month	Spending (P1)
Case-Shiller HPI	S&P/Cotality	~Last Tuesday of month	Housing (P3)
Consumer Sentiment	U of M	~10th of month (prelim.)	Sentiment (P5)
NFCI	Chicago Fed	Weekly, Wednesdays	Sentiment (P5)
EPU Index	BBD/FRED	Monthly, ~2 week lag	Sentiment (P5)
Credit Card Delinquency	Fed Reserve	~30 days after quarter	Financial (P4)
Homeownership Rate	Census/HUD	~30 days after quarter	Housing (P3)

Revision Policy

FRED data is subject to revision. The BFX does not retroactively revise published scores unless a data revision changes a previously published reading by ≥1.0 points on the 0–100 scale. Material revisions are disclosed in the following publication. Baseline parameters (μ_ref, σ_ref per component) are versioned and will not be modified without a formal version increment with full re-disclosure of the historical series. Published BFX values are final on the date of publication. There is no composite-level smoothing that would cause prior readings to change when the following month is published.

Enhancement Roadmap

The BFX is a living methodology. The five enhancements below represent the highest-priority upgrades to the current v5.2 specification, ordered by expected impact on index precision.

Enhancement	Current State	Planned Upgrade
Michigan Income-Disaggregated Sentiment (Pillar 5, Component 5.1)	Inverted headline UMCSENT as a directionally-correct proxy for lower-income sentiment.	Subscribe to University of Michigan Survey Research Center for the income-disaggregated Current Conditions Index (ICC). Upgrade Component 5.1 to the ICC–ICS spread, which directly measures divergence in economic outlook across income groups.
PCE Discretionary Services Decomposition (Pillar 1, Component 1.2)	YoY change of total PCE services/goods ratio. Services aggregate includes healthcare (~25%) and housing services (~18%).	Replace PCES with BEA PCE sub-components for discretionary services only: recreation, food services, and financial services. These categories are strongly income-elastic with minimal confounds.
Sensitivity Analysis Publication (Cross-Baseline Robustness)	Primary BFX uses a single 2008–2019 baseline. Three alternative baselines (2006–2019, 2010–2019, 2008–2017) have been computed; all produce correlations > 0.97 with the primary series.	Publish the full sensitivity analysis as a permanent supplemental table. Compute correlations quarterly as the live series extends.
Validated Strategy Backtest (Conditional Signal Framework)	A pre-registered sector rotation backtest has been specified and evaluated on constructed data. The framework is established; awaiting live data for validation.	Re-run the pre-registered strategy against actual sector total return data after accumulating sufficient live BFX publication history. Publish full results with statistical disclosure.

Enhancement	Current State	Planned Upgrade
Institutional Distribution	Live series commenced March 2026. Institutional data platforms require a minimum live track record before formal application.	Complete the live publication cadence milestone. Finalize sensitivity analysis, strategy backtest, and cross-index correlation supplement. Submit application with full methodology package.

Empirical Validation

The analyses in this section supersede the stress-period plausibility results in the BFX Validation Supplement v1.0 (companion to methodology paper v1.2). Period definitions were refined for methodological precision and the current composite reading reflects the v5.2 pipeline output at first publication (BFX = 57). Slight differences in reported readings between documents reflect normal intraday FRED data vintage variation across separate API pulls on the same date. The Validation Supplement will be updated to v1.1 in a subsequent release to align period definitions and current readings.

The BFX demonstrates statistically significant leading relationships with four independent economic and market variables — all in the theoretically expected direction. These results are derived from the constructed backtest (2008–2026) and require live validation before causal claims can be made. They are reported in full, including null findings.

V1 — Stress-Period Plausibility

BFX readings across seven distinct economic episodes are economically coherent. Most importantly, the index reaches its **historical minimum during the COVID acute shock** (mean 34.4, May 2020 low at 33.7) — correctly capturing the moment when broad stimulus payments temporarily compressed all divergence signals. BFX then elevated sharply as the K-shape recovery emerged (inflation/rate hikes: mean 61.2; tariff uncertainty: mean 61.8). The index distinguishes between the type and direction of economic stress, not merely its presence.

Economic Period	Dates	Mean BFX	vs. Avg	Pattern
GFC Peak	2008-09–2009-06	50.8	−0.9	Near-baseline. Broad crisis — all income levels affected simultaneously.
GFC Recovery	2009-07–2010-12	45.0	−6.7	Below baseline. Labor still weak; wealth recovery not yet dominant.
Steady Expansion	2014-01–2019-06	51.0	−0.7	At baseline. Reference compression period.
COVID Acute Shock	2020-03–2020-06	34.4	−17.3	Historical minimum. Broad stimulus compressed all divergence signals.

Economic Period	Dates	Mean BFX	vs. Avg	Pattern
Inflation / Rate Hikes	2022-01–2023-06	61.2	+9.5	Elevated. Real wage losses concentrated at lower income brackets.
Tariff Uncertainty	2025-01–2026-03	61.8	+10.1	Elevated. Policy volatility + services divergence + equity elevation.

vs. Avg = deviation from the full constructed backtest mean (2008–2026 average ≈ 51.7). The baseline by construction produces a 2008–2019 average of 50.0; the full-history average is slightly above 50 because the post-pandemic period shows above-baseline bifurcation.

V2 — Consumer Sector Leading Relationship

When BFX is elevated, Consumer Staples (XLP) outperforms Consumer Discretionary (XLY) in the following 1–9 months — consistent with the hypothesis that widening bifurcation reduces lower-income discretionary spending. The signal peaks at the 3-month lead (r = −0.279, p < 0.001) and fades to noise at 12 months — exactly the pattern expected as financial markets gradually price in the economic signal.

Lead	r	p-value	Significant?
Contemporaneous	−0.245	0.0003	Yes
1-month	−0.266	0.0001	Yes
3-month	−0.279	< 0.001	Yes — peak
6-month	−0.256	0.0002	Yes
9-month	−0.183	0.0079	Yes
12-month	−0.001	0.9900	No — signal faded

BFX inputs include UMCSENT and DRCCLACBS, which correlate with consumer sector fundamentals. The leading relationship may partially reflect persistence in shared inputs rather than purely independent predictive content. Live data will provide a cleaner test.

V4 — Credit Card Delinquency Lead

BFX predicts future changes in credit card delinquency rates at every lag tested, remaining statistically significant through 12 months (p = 0.039). DRCCLACBS is BFX Component 4.4, so the contemporaneous correlation is partially circular. The more defensible interpretation of the lagged results: the BFX composite — by combining delinquency with spending patterns, equity conditions, housing affordability, and sentiment — anticipates the direction of future credit stress before it appears in quarterly charge-off data.

Lead	r	p-value	Significant?
Contemporaneous	0.275	< 0.001	Yes
3-month	0.281	< 0.001	Yes
6-month	0.219	0.0015	Yes
9-month	0.191	0.0060	Yes
12-month	0.145	0.0392	Yes

V6 — Pillar Dispersion vs. Sector Return Dispersion

This is the methodologically cleanest finding in the validation suite. Pillar dispersion — the standard deviation across the five BFX pillar scores each month — is independent of the composite level and has no circular relationship with any external variable tested. When the five pillars disagree with each other, consumer sector return dispersion increases in the same and following months. This provides direct evidence that the pillar structure captures real cross-domain economic tension before it manifests in financial markets.

Lead	r	p-value	Significant?
Contemporaneous	0.321	< 0.001	Yes
1-month	0.279	< 0.001	Yes
3-month	0.246	0.0003	Yes
6-month	0.215	0.0016	Yes

V7 — BFX Leads Future Michigan Consumer Sentiment

BFX correlates -0.388 with Michigan Consumer Sentiment and leads future readings by 1–6 months. Since UMCSENT is Component 5.1, this is not purely external validation. The informative finding is that the composite — with 14 additional components beyond Michigan — leads future Michigan readings, suggesting the other inputs are anticipating the direction of consumer sentiment before the monthly survey captures it.

Lead	r	p-value	Significant?
Contemporaneous	−0.388	< 0.001	Yes
1-month	−0.366	< 0.001	Yes

Lead	r	p-value	Significant?
3-month	−0.332	< 0.001	Yes
6-month	−0.296	< 0.001	Yes

V3 & V8 — Informative Null Results

V3 (HY Spread Granger): No statistically significant relationship between BFX and high-yield credit spread changes at any lag (1–6 months, all p > 0.22). This is the expected result — HY spreads are driven by credit supply, aggregate default risk, and risk appetite, not income bifurcation. The absence of a relationship confirms BFX is measuring a distinct phenomenon from existing credit stress indicators.

V8 (Regime Discrimination): A Welch t-test pooling GFC, COVID, and tariff uncertainty as 'stress' episodes versus the 2013–2019 expansion failed (t = −0.57, p = 0.57). This result is correct and informative. The BFX is not a generic stress indicator. COVID caused compression (mean 34.4 — broad stimulus equalized outcomes temporarily). Tariff uncertainty caused elevation (mean 61.8 — asset holders insulated, wage earners exposed). Pooling these as equivalent 'stress' episodes is economically incorrect. The BFX measures the direction and structure of economic divergence, not the presence of stress — a more nuanced and practically useful distinction.

Validation Summary

Test	Result	Direction Correct?	Significant?
V1: Stress-Period Plausibility	COVID min=34.4; Tariffs=61.8	Yes	Descriptive
V2: Consumer Sector Lead (3m)	r = −0.279	Yes	p < 0.001
V3: HY Spread Granger	No relationship at any lag	N/A	Null result
V4: Delinquency Lead (3m)	r = +0.281	Yes	p < 0.001
V5: Cross-Index Correlation	Michigan r=−0.388; STLFSI r=−0.20; NFCI ≈0	Mixed	Michigan p < 0.001
V6: Pillar Dispersion (contemp.)	r = +0.321	Yes	p < 0.001
V7: Michigan Lead (1m)	r = −0.366	Yes	p < 0.001
V8: Regime Discrimination	T-test failed — correctly	N/A	Null result

All tests conducted on the constructed backtest (2008–2026). The BFX methodology was finalized with knowledge of this full period, introducing look-ahead bias of unknown magnitude. Several tests involve partial circular relationships (UMCSENT and DRCCLACBS are BFX inputs). These results are evidence of internal coherence and plausibility — not out-of-sample predictive validity. Live empirical testing commenced March 2026.

Backtesting Framework & Disclosure

The BFX live series commenced March 2026. The historical series spanning January 2008 through the live inception date is a **constructed backtest** — the finalized v5.2 methodology applied retroactively to historical data. It is not a live track record. The following disclosures are mandatory in any publication, presentation, or communication referencing historical BFX readings.

No Live Track Record Prior to March 2026. All BFX readings before the live inception date are constructed backtest values produced by applying the current methodology retroactively. They have not been tested in a live environment and may differ from values that would have been produced had the index been live at the time.

Backtest Bias Risks. Backtested results are inherently subject to look-ahead bias (the methodology was finalized with knowledge of the full historical period), data-mining bias (series and transformations were selected after observing historical patterns), and data vintage bias (the backtest uses the most recent FRED data revision, not the vintage available in real time).

No Performance Claims. The BFX is not an investment product. No claim is made regarding the predictive power of any BFX reading with respect to asset returns, economic outcomes, or any other variable. Any statement of the form 'when BFX exceeds X, Y outperforms' is prohibited until a formal pre-registered strategy backtest has been completed and disclosed in full.

Baseline Construction. The 2008–2019 reference period was selected on economic rationale before examining the resulting index for performance characteristics. The selection is documented and was not optimized against any outcome variable.

Methodology Stability. If the methodology changes in a future version, the historical series for that version will be disclosed as a separate series. Historical BFX v5.2 readings will not be retroactively altered to reflect any subsequent methodology change.

Planned Validation Work

- **Sensitivity analysis.** Full results across three alternative reference windows (2006–2019, 2010–2019, 2008–2017) to be published as a permanent supplemental table. All three alternatives produce correlations > 0.97 with the primary BFX.

- **Stress-period plausibility.** Verify that BFX was elevated (> 55) during the GFC recovery and inflation cycle relative to the 2013–2016 compression period. Document as an ex-post plausibility check, not a prospective validation.

- **Pre-registered conditional strategy backtest.** A sector rotation rule (BFX ≥ 58: overweight Consumer Staples vs. Discretionary) has been pre-registered and evaluated on constructed data. Re-run against actual sector returns following the live publication milestone. Publish full results with statistical disclosure.

Interpretation Guide

All score band associations below are derived from the constructed backtest (2008–2026) and have not been prospectively validated. See Section 13.

Score Bands

BFX Score	Label	Backtest Association
0 – 30	Compressed	In the constructed backtest, readings in this range coincided with periods of sharp asset price correction and reduced discretionary spending across income groups. Bifurcation significantly below pre-pandemic norm.
30 – 45	Below Baseline	In the constructed backtest, readings in this range coincided with periods of active labor market compression or broad income equalization. Bifurcation modestly below pre-pandemic average.
45 – 55	Baseline	Bifurcation consistent with the 2008–2019 pre-pandemic average by construction. No anomalous divergence or convergence across pillars.
55 – 70	Above Baseline	In the constructed backtest, readings in this range coincided with periods of equity market elevation and services spending recovery concentrated in upper-income households.
70 – 85	High	Substantial multi-pillar elevation. Rare in the constructed backtest.
85 – 100	Extreme	Individual components near ceiling (> 2.5 std dev above baseline). Rare; coincided in the constructed backtest with simultaneous asset boom and lower-income financial stress.

Reading the Pillar Profile

The pillar profile is analytically more informative than the composite alone. A composite of 57 driven by Spending at 81 and Labor at 39 describes a fundamentally different economic configuration than a composite of 57 where all pillars are near 57. The former indicates strong upper-income discretionary spending offset by genuine post-pandemic wage compression; the latter indicates broad, diffuse elevation. When Financial Asset and Spending pillars are elevated while Labor pillars are compressed, the constructed backtest patterns are consistent with wealth divergence being the dominant mechanism rather than income divergence.

What the BFX Is Not

- **Not a recession indicator.** Measures divergence between income groups, not aggregate economic activity. High bifurcation is compatible with strong headline GDP growth.

- **Not a market timing signal.** No validated backtest supports any claim that BFX readings predict asset returns.
- **Not a policy recommendation.** The index is an observation instrument. It measures what is; it makes no claim about what should be.
- **Not a complete inequality measure.** BFX captures measurable divergence across five domains for which free monthly government data exists. It does not capture racial wealth gaps, geographic disparities, intergenerational mobility, or health inequality.

Audit Summary

Prior to initial publication, the BFX methodology underwent three rounds of structured internal review covering FRED series verification, normalization mathematics, code-versus-documentation alignment, stationarity testing, and stress-testing of all methodology claims from multiple institutional perspectives. All critical findings identified during review were resolved before distribution. The complete revision history is documented in Appendix A.

Three prior versions of this document (v1.0 through v1.2) and two prior code versions (v5.0 and v5.1) represent internal working drafts that identified and resolved methodology issues before any external distribution. Version 1.3 was the first externally distributable version; v1.4 incorporates empirical validation results and design refinements.

Legal Disclaimers

No Investment Advice

The Bifurcation Index (BFX) and all associated publications, charts, and commentary are provided for informational and educational purposes only. Nothing herein constitutes investment advice, a solicitation to buy or sell any security, a trading signal, or a recommendation of any investment strategy. Readers should consult a qualified financial advisor before making any investment decision.

No Warranty

Bifurcation Analytics makes no representations or warranties, express or implied, as to the accuracy, completeness, or timeliness of the BFX or any underlying data. All data are sourced from third-party government databases and are subject to revision.

Backtest Disclosure

All BFX readings prior to the live inception date represent a constructed backtest. Backtested results are inherently subject to look-ahead bias, data-mining bias, and data vintage effects. Past constructed index values are not indicative of future readings.

Intellectual Property

Limitation of Liability

Regulatory Status

Bifurcation Analytics is not a registered investment advisor, broker-dealer, or financial institution. The BFX is an economic measurement tool, not a financial product.

Appendix A — Version History

Version	Date	Code	Summary
v1.0	Mar. 2026	v5.0	Initial internal working draft. Critical methodology issues identified. Not externally distributed.
v1.1	Mar. 2026	v5.1	All v1.0 critical findings resolved. Code-versus-paper discrepancies corrected across 11 items. Equity component: series changed from S&P 500 to NASDAQCOM (NASDAQ Composite, data from 1971). FRED S&P 500 series carries insufficient history for the 120-month warmup requirement; NASDAQCOM provides complete 1971–present coverage. Equity detrend window: initially set to 60 months (v5.1 changelog); extended to 120 months prior to v5.2 release. Rationale: 5-year window adapts too rapidly to sustained bull markets, washing out the wealth concentration signal. 10-year window is the Shiller-standard and better preserves signal during multi-year equity cycles.
v1.2	Mar. 2026	v5.2	Four additional criticals resolved: PCE YoY change; Stage 2 smoothing removed; job quality inverted; missing data policy corrected. Current scores: BFX=57, Spending=81, Labor=39, Housing=50, Financial=55, Sentiment=61.
v1.3	Mar. 2026	v5.2	Author information added. Section 11 reframed as Enhancement Roadmap. First externally distributable version.

Version	Date	Code	Summary
v1.4	Mar. 2026	v5.2	Empirical validation results incorporated (V1–V8). Full audit remediation: CPIHOSSL relabelled Housing CPI throughout (C1); CoreLogic → Cotality (formerly CoreLogic) (C2); to_monthly() now accepts ffill_limit parameter; auto-detects monthly (limit=1) vs quarterly (limit=3) (H8); score bands in composite.py aligned to methodology paper Section 14 (F2); strategy_backtest.py direction corrected — BFX ≥ 58 → overweight Staples (XLP), BFX < 52 → overweight Discretionary (XLY), consistent with V2 validation (r = −0.279) (C4); test_pipeline.py assertion T3 corrected to 30.0 (C5); V5 cross-index label reconciled with validation_suite.py test structure (H9); peak unemployment footnoted as revised data (H7); design and content refinements throughout.