The U-Haul "Index"

A Five-Year Framework for Building a Mobility-Adjusted Population and Market Growth Index (2021–2025)

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Abstract

Researchers and practitioners increasingly treat migration and residential mobility as leading indicators for regional labor demand, housing pressure, consumer spending, and business formation. Within this broader measurement landscape, the term "U-Haul Index" typically refers to the U-Haul Growth Index, an annual ranking that infers relative "growth" by comparing one-way U-Haul equipment transactions entering and leaving a state. U-Haul calculates these rankings from millions of customer transactions and reports them as an ordinal list rather than a direct estimate of population change or economic output. In fact, U-Haul explicitly cautions that the Growth Index does not directly measure population or economic growth, making careful interpretation essential when researchers use it as a proxy for forecasting.

In this research, I synthesize the key elements of the U-Haul Growth Index and build several interactive models to illustrate the index. I present a disciplined method for converting its ordinal signals into a five-year mobility-adjusted population index that hospital financial leaders can integrate into prediction systems for market growth or contraction. The proposed framework converts ranks to percentiles, constructs multi-year smoothed mobility signals, calibrates those signals against external benchmarks such as IRS/ACS migration series or USPS change-of-address aggregates, and then blends the mobility proxy with fundamentals (interest rates, affordability, labor strength, business formation, and energy or logistics pressures). The paper situates this approach within the peer-reviewed literature on alternative data and economic nowcasting, emphasizing measurement error, validation, and uncertainty quantification as core requirements for credible inference.

Keywords: U-Haul Growth Index, domestic migration, alternative data, nowcasting, regional forecasting, population mobility, housing affordability, labor markets, measurement error, scenario modeling

Introduction

Economists have long recognized that migration responds to wage differentials, housing costs, local amenities, and shocks such as recessions, disasters, and policy changes. Migration also feeds back into regional growth: inflows expand labor supply and consumer demand while increasing housing pressure, and outflows can signal weakening opportunity structures or affordability constraints. The practical challenge is timing. Official migration measures often arrive with lags, revisions, and definitional discontinuities. That gap creates demand for high-frequency or proxy mobility signals that can support near-term forecasting and scenario analysis.

The recent wave of research on alternative data reflects this need. Peer-reviewed work in forecasting and statistics shows that nontraditional signals can improve timeliness, but only if researchers treat them as noisy measurements of latent economic processes rather than as direct ground truth. For this reason, contemporary nowcasting research emphasizes rigorous calibration, model comparison, and out-of-sample validation, particularly when the proxy is derived from a platform or commercial transaction stream that reflects selection and coverage biases.

Within this context, the U-Haul Growth Index has become a widely cited, intuitively appealing indicator because it is easy to understand: more one-way moves into a state than out of it suggest a net inflow. The temptation is to treat the annual list as a definitive "migration leaderboard" and then to infer population growth, labor market strength, or even housing appreciation. That temptation is precisely where good research practice must intervene. U-Haul's own methodological notes and disclaimers provide the starting point for a responsible interpretation.

What the U-Haul Index Actually Is

2.1. The official construct: the U-Haul Growth Index: U-Haul publishes an annual ranking of states that it describes as a measure of how well states "are attracting and maintaining residents," based on net gains in one-way U-Haul equipment transactions (trucks, trailers, and U-Box moving containers) arriving in a state versus departing it. The company frames the index as a mobility signal derived from customer behavior rather than from survey enumeration.

2.2. The calculation, as U-Haul describes it: Across multiple years of documentation, U-Haul states that it calculates growth states by the net gain or loss of one-way customers: arrivals minus departures. The company also reports that it compiles the annual index from a large transaction base, often described as exceeding 2.5 million one-way transactions per year across the U.S. and Canada.

2.3. The critical limitation: ordinal rank is not population or GDP: Most importantly, U-Haul explicitly notes that Growth Index rankings do not directly correlate to population growth or economic growth. This statement is methodologically decisive: it indicates that the index should be treated as a proxy for a latent construct (mobility pressure, net moving demand, or household relocation intensity) rather than as a direct measure of net migration rates, population change, employment growth, or output growth.

Why the U-Haul Index is Valid

3. Why the Index Still Matters: Theory of Signal Content: Even with the disclaimer, the index can carry meaningful information for economists for a straightforward reason: household moves encode decision-making under constraints. People move when expected utility changes, whether due to job opportunities, cost of living, climate risk, family dynamics, or the feasibility of remote work. The U-Haul index does not capture the entire migration universe, but it can reflect directional pressures among segments of the population that use do-it-yourself moving solutions.

Here, the peer-reviewed literature on alternative data provides the appropriate framing. Proxy datasets can enhance nowcasting if they satisfy three conditions: (1) they co-move with the target construct, (2) they add incremental information beyond traditional predictors, and (3) researchers model their noise, bias, and instability. The forecasting literature in the *International Journal of Forecasting* and related venues consistently makes the point: alternative data should be evaluated as measurement systems, not celebrated as shortcuts.

Mobility Model

4. Building a Five-Year Mobility-Adjusted Population Index from U-Haul Data (2021–2025): This section provides a research-grade workflow to transform annual U-Haul Growth Index ranks into a five-year mobility-adjusted population index suitable for forecasting applications.

4.1. Step 1: Convert ranks to percentiles (make the ordinal usable): Let $r_{s,t}$ be the rank of the state s in year t (1 is the highest net inflow). Convert to a percentile-style signal:

$$m_{s,t} = \frac{(N+1) - r_{s,t}}{N}$$

where $N = 50$for states. This map ranks into $[0, 1]$, enabling comparison across years and integration with other standardized predictors. U-Haul has published annual state rankings (and often city or metro lists) over the years in its migration reporting ecosystem, which allows the construction of a panel for the last five completed years of rankings.

4.2. Step 2: Smooth across five years (separate signal from noise): Single-year ranks can swing due to shocks, supply constraints, or platform-specific factors. A five-year index should emphasize persistence while still responding to recent change. Use an exponentially weighted moving average:

$$\bar{m}_{s,2025} = \sum_{k=0}^{4} w_k \, m_{s,2025-k}, w_k \propto \lambda^k, 0$$

Choose λbased on forecasting performance in validation (for example, $\lambda = 0.7$places greater weight on recent years but still draws on history.

4.3. Step 3: Calibrate mobility percentiles to external migration benchmarks: Because U-Haul warns that its index does not directly measure population growth, researchers should calibrate the proxy against an external series that more directly captures migration or address mobility. One practical calibration approach uses USPS-aggregated change-of-address-based products as a bridge because they are explicitly designed around change-of-address records and mobility patterns. The USPS describes datasets constructed from aggregated change-of-address data and Census demographic data that support regional comparisons. Calibration can take a simple reduced-form structure:

$$\text{NetMigRate}_{s,t} = \alpha + \beta \bar{m}_{s,t} + \gamma X_{s,t} + \varepsilon_{s,t}$$

where $X_{s,t}$includes fundamentals (affordability, labor strength, rates). The goal is not to declare causal identification; it is to map an ordinal commercial proxy onto a more interpretable scale and to quantify uncertainty.

4.4. Step 4: Adjust for selection and coverage bias: U-Haul customers represent a subset of movers. The proxy likely overrepresents certain household types (e.g., cost-sensitive movers or those relocating short distances) and may underrepresent high-income moves handled by full-service providers. A defensible index, therefore, includes either (a) explicit correction factors derived from cross-validation error patterns or (b) partial pooling through hierarchical modeling that shrinks extreme estimates toward regional means when uncertainty is high.

4.5. Step 5: Combine mobility with fundamentals into a forecasting model: Once researchers have built a calibrated mobility signal, they can integrate it into a predictive model of market growth or contraction. The alternative data literature supports such blended systems, in which proxy signals complement macroeconomic and regional fundamentals, particularly for short-horizon nowcasts. Recent peer-reviewed work discusses how modern nowcasting leverages multiple information streams and emphasizes model evaluation under structural change.

Model Forecast

5. From Index to Forecast: A Transparent Scenario Model for Growth and Contraction: A practical way to operationalize the index is to treat the five-year mobility signal as an "attractor" variable and then blend it with fundamentals that map to known transmission channels:

- Real interest rates: credit sensitivity and housing turnover
- Housing affordability stress: constraint on in-migration and consumption
- Labor market strength: wage support and demand resilience
- Business formation momentum: entrepreneurial pipeline and local dynamism
- Energy and logistics pressure: moving costs and input cost stress
- External demand impulse: exports, tourism, sectoral shocks

This blended approach aligns with the methodological caution recommended in the alternative data literature: use the proxy, but do not let it dominate without evidence.

6. Interpretation: What the Data Can and Cannot Tell Economists: What it can tell us (if handled correctly):

1. Directional mobility pressure: whether a state or metro looks like a relative net inflow destination in the U-Haul customer segment.
2. Short-horizon risk posture: When combined with affordability, rates, and labor conditions, the mobility signal can contribute to probabilistic assessments of expansion versus contraction.
3. Scenario sensitivity: economists can test how shocks to mobility demand or financing conditions propagate through a market index trajectory.

What it cannot tell us (without calibration and validation):

1. True population change: U-Haul states its index does not directly correlate to population growth.
2. Causal effects: net inflow states may differ systematically in policy, industry mix, or housing supply elasticity. Without credible identification, the index should remain a forecasting signal rather than a causal instrument.
3. Complete migration flows: the index reflects the subset of moves that U-Haul observes.

7. Limitations and Research Ethics: The index's strengths are also its vulnerabilities. It is proprietary in origin, platform-mediated, and potentially sensitive to operational constraints, including equipment supply, pricing strategy, and geographic availability. Researchers should therefore (1) conduct stability checks (does the mapping hold across years?), (2) evaluate performance across regimes (pandemic era, tightening cycles), and (3) quantify uncertainty rather than present point estimates as certainties. Peer-reviewed research on alternative data repeatedly returns to this principle: the credibility of proxy-based inference rises or falls with the degree of validation discipline.

Final thoughts: The U-Haul Growth Index, often colloquially referred to as the "U-Haul Index," is a compelling mobility proxy because it is intuitive, timely, and grounded in real customer transactions. Yet U-Haul's own documentation makes the core methodological point unavoidable: the index is not a direct measure of population growth or economic growth. That limitation does not make the index useless. Instead, it defines the research task.

Economists can extract value from the U-Haul signal by treating it as an ordinal proxy for latent mobility pressure, converting ranks to percentiles, smoothing across multiple years, calibrating against external migration benchmarks such as address-change aggregates, and blending the mobility signal with fundamentals in a transparent forecasting model. When done carefully, the result is not a headline-friendly leaderboard but a defensible, testable, and updateable mobility-adjusted population- and market-growth index that can support prediction, scenario planning, and risk communication.

Model Examples

1) Rank to mobility percentile (state mode): Dashboard mapping (state proxy):

$$m_{s,t} = \text{clamp}\left(\frac{51 - r_{s,t}}{50}, 0, 1\right)$$

Example: State rank $r = 10$

$$m = \frac{51 - 10}{50} = \frac{41}{50} = 0.82$$

So the mobility percentile is 0.82 (82nd percentile).

Boundary check examples (practical for validation):

- If $r = 1, m = (51 - 1)/50 = 1.00$
- If $r = 50, m = (51 - 50)/50 = 0.02$

This is why the rank should always be constrained to 1–50, and the percentile clamped to [0,1].

2) Apply a mobility shock (scenario lever): Dashboard shock rule: If the shock is s(for example, +10% means $s = 0.10$), then:

$$m' = \text{clamp}(m(1 + s), 0, 1)$$

Example: baseline $m = 0.82$, shock $s = +0.10$

$$m' = 0.82(1.10) = 0.902$$

So the shocked mobility signal becomes 0.902.

Example: baseline $m = 0.82$, shock $s = -0.20$

$$m' = 0.82(0.80) = 0.656$$

This multiplicative design makes interpretation intuitive: “mobility demand is 10% higher or lower than implied by the base rank.”

3) Five-year smoothing for a mobility-adjusted population index (EWMA)

This is not required for a single dashboard run, but it is essential if you are building a five-year index from annual ranks.

EWMA structure (rewrite, with explicit normalization):

$$\bar{m}_{s,T} = \sum_{k=0}^{4} w_k \; m_{s,T-k} \text{where} w_k = \frac{\lambda^k}{\sum_{j=0}^{4} \lambda^j}$$

Example: Suppose the converted percentiles for 2021–2025 are:

- 2021: 0.70
- 2022: 0.74
- 2023: 0.78
- 2024: 0.80
- 2025: 0.82

Choose $\lambda = 0.70$. Raw weights:

- $1.0000, 0.7000, 0.4900, 0.3430, 0.2401$
  Sum $S = 2.7731$. Normalized weights:
- $w_0 = 0.3606$, $w_1 = 0.2525$, $w_2 = 0.1767$, $w_3 = 0.1237$, $w_4 = 0.0866$

Compute:

$$\bar{m} = 0.3606(0.82) + 0.2525(0.80) + 0.1767(0.78) + 0.1237(0.74) + 0.0866(0.70) \approx 0.788$$

So the smoothed five-year mobility is 0.788. Why this matters: it reduces one-year noise and gives you a more stable "mobility pressure" index.

4) Fundamentals normalization (exact dashboard approach)

The dashboard converts raw inputs into normalized scores, then blends them.

Normalizations (from the code):

- Real rate $r$in $[-2,10]$:

$$r_N = \text{clamp}\left(1 - \frac{r+2}{12}, 0, 1\right)$$

- Housing stress Hin $[0, 100]$:

$$h_N = 1 - \frac{H}{100}$$

- Labor Lin $[0, 100]$:

$$l_N = \frac{L}{100}$$

- Business momentum Bin $[0, 100]$:

$$b_N = \frac{B}{100}$$

- Energy pressure E in $[0, 100]$:

$$e_N = 1 - \frac{E}{100}$$

- External impulse X in $[-5,5]$:

$$x_N = \text{clamp}\left(\frac{X+5}{10}, 0, 1\right)$$

Example inputs (dashboard defaults):

- $r = 2.0$, $H = 55$, $L = 60$, $B = 58$, $E = 45$, $X = 0.8$

Compute each:

- $r_N = 1 - (2+2)/12 = 1 - 0.3333 = 0.6667$
- $h_N = 1 - 0.55 = 0.45$
- $l_N = 0.60$
- $b_N = 0.58$
- $e_N = 1 - 0.45 = 0.55$
- $x_N = (0.8 + 5)/10 = 0.58$

5) Fundamentals index (exact dashboard weights): Dashboard fundamentals index:

$$f = \text{clamp}(0.26r_N + 0.22h_N + 0.22l_N + 0.14b_N + 0.10e_N + 0.06x_N, 0, 1)$$

Example (plugging values above):

$$f = 0.26(0.6667) + 0.22(0.45) + 0.22(0.60) + 0.14(0.58) + 0.10(0.55) + 0.06(0.58) \approx 0.5753$$

So the fundamentals index is 0.575.

6) Calibration weights (mobility vs fundamentals): Dashboard weights:

- Light (proxy-forward): $w_M = 0.62$, $w_F = 0.38$
- Balanced: $w_M = 0.50$, $w_F = 0.50$
- Anchored (fundamentals-forward): $w_M = 0.35$, $w_F = 0.65$

Example: choose Balanced:

$$(w_M, w_F) = (0.50, 0.50)$$

7) Growth nowcast (annualized, exact dashboard equation)

The dashboard centers both signals at 0.5 and rescales to $[-1,1]$:

$$m_C = 2(m - 0.5), f_C = 2(f - 0.5)$$

Nowcast equation (slope is 0 for state and metro modes):

$$g = 2.0 + (w_M \cdot 4.8 \cdot m_C) + (w_F \cdot 5.2 \cdot f_C) + 1.1 \cdot \text{slope}$$

Then clamp to $[-8,10]$.

Example: mobility after shock $m = 0.902$, fundamentals $f = 0.5753$, balanced weights.

- $m_C = 2(0.902 - 0.5) = 0.804$
- $f_C = 2(0.5753 - 0.5) = 0.1506$

Compute:

$$g = 2.0 + 0.50(4.8)(0.804) + 0.50(5.2)(0.1506)$$
$$g = 2.0 + 1.9296 + 0.3916 \approx 4.321$$

So the growth nowcast is +4.32% annualized.

8) Recession probability (next 4 quarters), exact dashboard logit: The dashboard builds a linear score z, then maps it through a logistic function:

$$p = \frac{1}{1 + e^{-z}}$$

Dashboard $z$equation:

$$z = 0.35(r - 2.0) + 0.025(H - 50) + 0.020(E - 50) - 0.030(L - 55) - 1.10(m - 0.5) - 0.55$$

Then clamp $p$to $[0.03, 0.85]$.

Example (same inputs as above):

- $r = 2.0 \Rightarrow 0.35(r - 2) = 0$
- $H = 55 \Rightarrow 0.025(5) = 0.125$
- $E = 45 \Rightarrow 0.020(-5) = -0.10$
- $L = 60 \Rightarrow -0.030(5) = -0.15$
- $m = 0.902 \Rightarrow -1.10(0.402) = -0.4422$
- constant -0.55

Sum:

$$z = 0 + 0.125 - 0.10 - 0.15 - 0.4422 - 0.55 = -1.1172$$
$$p = \frac{1}{1 + e^{1.1172}} \approx 0.2465$$

The probability of a recession over the next 4 quarters is approximately 24.7%.

9) Market index simulation over the horizon (exact dashboard mechanics): The dashboard converts annualized $g$into a quarterly mean:

$$q_{\text{mean}} = \frac{g}{100 \cdot 4}$$

It mean-reverts toward a baseline of 2% annual:

$$q_{\text{base}} = \frac{2.0}{100 \cdot 4} = 0.005$$
$$q_t = q_{\text{base}} + (q_{\text{mean}} - q_{\text{base}}) \cdot e^{-t/10}$$

Then subtract a recession drag:

$$\text{drag} = p \cdot 0.0065, q_t^{\text{eff}} = q_t - \text{drag}$$

Update the index:

$$\text{Index}_t = \text{Index}_{t-1} \cdot e^{q_t^{\text{eff}}}$$

Annualized growth reported each quarter:

$$\text{GrowthAnn}_t = q_t^{\text{eff}} \cdot 4 \cdot 100$$

Uncertainty band uses:

$$\sigma = 0.012 + 0.030p$$

and then applies $\pm\sigma$to the log growth each quarter.

Part B. One complete end-to-end worked example (exactly like your dashboard): Step 0. Choose an illustrative scenario

Mode: State proxy
U-Haul rank: 10
Mobility shock: +10%
Calibration: Balanced
Horizon: 12 quarters
Base index: 100
Fundamentals:

- Real rate $r = 2.0$
- Housing stress $H = 55$
- Labor strength $L = 60$
- Business momentum $B = 58$
- Energy pressure $E = 45$
- External impulse $X = 0.8$

Step 1. Mobility signal

Rank 10 maps to:

$$m = \frac{51 - 10}{50} = 0.82$$

Apply +10% shock:

$$m' = 0.82(1.10) = 0.902$$

So mobility signal = 0.902.

Step 2. Fundamentals index: Compute normalized components:

- $r_N = 0.6667$, $h_N = 0.45$, $l_N = 0.60$, $b_N = 0.58$, $e_N = 0.55$, $x_N = 0.58$

Fundamentals index:

$$f \approx 0.5753$$

Step 3. Growth nowcast (annualized)

Center and scale:

- $m_C = 0.804$
- $f_C = 0.1506$

Balanced weights produce:

$$g \approx 4.321\%$$

The dashboard reports a Growth nowcast ≈ of approximately +4.32% (annualized).

Step 4. Recession probability (next 4Q)

Using the dashboard logit score:

$$z = -1.1172 \Rightarrow p \approx 0.2465$$

So: Recession probability ≈ 24.7%.

Step 5. Simulate 12-quarter index path: Key intermediate values:

- $q_{\text{mean}} = g/(100 \cdot 4) = 4.321\%/400 \approx 0.010803$
- $\text{drag} = p \cdot 0.0065 \approx 0.001602$
- uncertainty $\sigma = 0.012 + 0.030p \approx 0.01940$

Starting at index 100, the simulation yields approximately:

Quarter	Market Index	Growth (annualized, %)
Q1	100.87	+3.46
Q2	101.69	+3.26
Q3	102.48	+3.08
Q4	103.23	+2.92
Q8	~105.87	~2.40
Q12	108.26	+2.06

So the dashboard would show: End-of-horizon index ≈ 108.3.

Interpretation: In this scenario, the model projects a moderate upward trajectory in the market index over 3 years, with growth decelerating toward a baseline as mean-reversion and recessionary forces accumulate.

Step 6. Uncertainty band at the horizon: Using $\pm\sigma$Each quarter (as the dashboard does), the end-of-horizon band is wide by design in this sandbox. For this scenario:

- Lower band at Q12: ~85.8
- Upper band at Q12: ~136.6

Interpretation: The uncertainty band indicates that the model is intentionally conservative in its forecast precision. It is better read as "risk envelope" than a confidence interval tied to formal estimation.