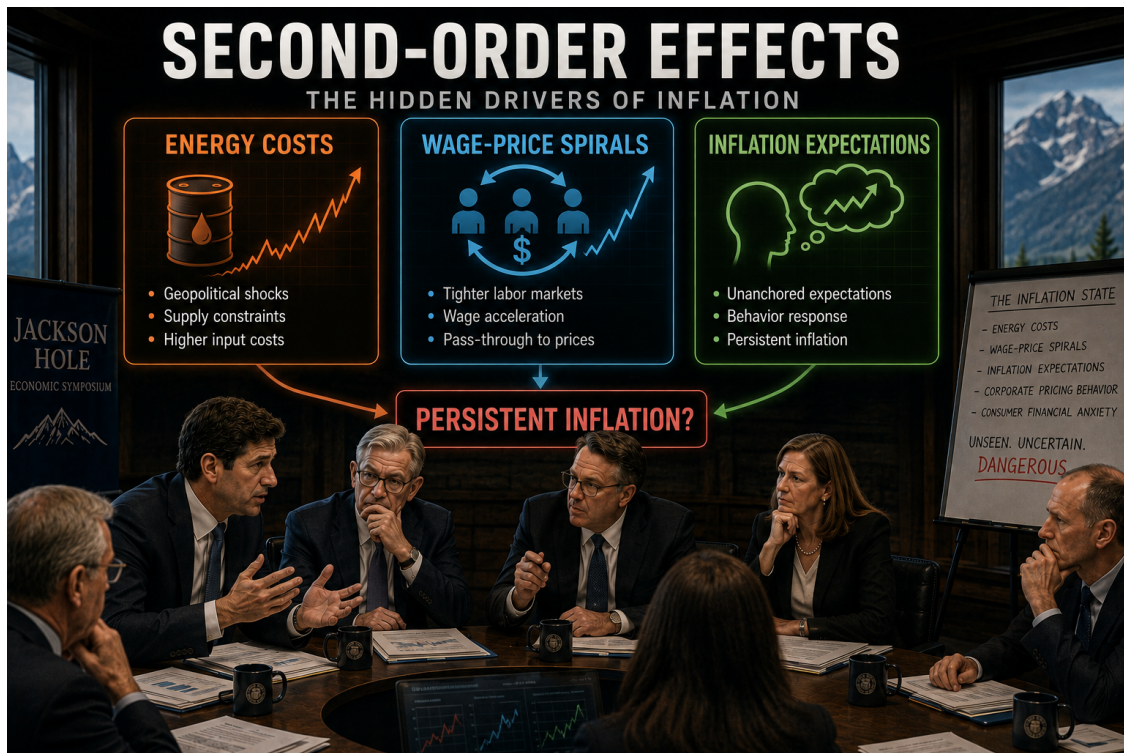


Real-Time Inflation State: Energy Shocks, Latent Risks and Inflation Decisions

MacroXStudio, August 2026



Key Takeaways

- Even with recent inflation prints being low, the labor market largely soft, and the Iran War representing a classic supply shock, central bankers remain concerned about inflation, with bond markets across US, UK, and EU still pricing ~40 bps of hikes for the year.
- This is not irrational - inflation itself is measured noisily and experts remain concerned about “second-order effects” of energy shocks such as wage-price spirals, long-term inflation expectations de-anchoring, and rising corporate markups that take time to manifest, and are either latent (and inferred) or estimated with 1-3 month lags
- Previous advances like alternative-data-based inflation prediction solve a different problem: predicting government releases, often without interpretability. Online prices represent a significant advance in the speed of goods-price measurement, but do not address wage pressure, inflation expectations, or the other latent concerns highlighted by experts.

- MacroX’s recent advances make it possible to directly measure the crucial real-time variables that span the inflation state—such as wage pressure, inflation expectations, corporate pricing strategy, energy concerns, and consumer financial anxiety—in addition to online prices.
- This paper steps through one such variable, MacroX Wage Pressure in detail to illustrate the methodology
- These variables correspond to the experts’ concerns in the recent speeches, tend to be unpriced by the consensus estimates of economists, and are not fully captured by well-known sources of alternative data - for instance MacroX's wage-pressure indicator leads the Employment Cost Index by roughly 1–3 months and statistically dominates Indeed, ADP and Revelio wage measures in horse-race regressions.
- In Live Testing over the last three years we find that this real-time measurement confers four major advantages - a 1 to 3 month speed advantage, higher conviction in out of consensus positions from relying on economic theory rather than a black box, scalability across countries, and perhaps most crucially falsifiable claims.
- Specifically for the current situation, MacroX data for the US show Inflation Expectations noisily declining, Corporate Pricing intentions contained, Wage Pressures neutral, and Growth above trend but not accelerating. If any of these change materially, our view would change.

1 Why Central Bankers Are Not Happy With Low Inflation Prints Alone?



Figure 1: MacroX’s AI tool analysis of the BoE’s latest press conference found repeated mentions of second-order effects, similar results were found in our analysis of the ECB and the FOMC press conferences.

Despite CPI in the US, UK, and Euro Area running below consensus since the start of the Iran war, central bankers have remained notably hawkish, with interest rate futures now pricing in roughly 40bps of hikes across 2026 in most DM economies.

The recurring explanation offered by policymakers (see Fed Official Williams [here](#), ECB President Lagarde [here](#) and the latest BoE minutes [here](#)) is a concern with what they term "second-order effects" - the risk that the energy price shock feeds through into wage growth, unanchors inflation expectations, or gives corporates cover to raise markups on the back of higher input costs.

Crucially, these second-order drivers such as wage pressure, inflation expectations, corporate markups, or other indirect results of high energy costs are not directly observable: like headline inflation itself, they must be inferred from data that is lagged and frequently revised, meaning central bankers are effectively flying blind on the very channels they cite as justifying a hawkish stance.

Factors from Speeches	Typical Official Measurement (US Example)	Typical Lag
Labor Market/Wages	ECI, NFP, Unemployment Rate, AHE, JOLTS	1–3m
Supply Chain	GSCPI, Baltic Dry Index	0–1m
Aggregate Demand	GDP, PMI	1–3m
Commodities	Crude/Brent Oil, Natural Gas, Food	0m
Financial Conditions	Asset Prices	0m
Inflation Expectations	UMich, NYFed	1m

2 How Experts Currently Infer The Inflation State

The popular driver referenced by Fed officials is the labor market/wage growth. This is unsurprising given labor costs are an extremely important driver of the cost of production while labor income dictates how much consumers are able to spend on new goods and services. We can see that month on month changes to Services CPI are extremely noisy but the Fed’s preferred measure of labor costs/wage pressures - the Employment Cost Index (ECI) is significantly smoother and a cleaner signal of the inflation state. However, the ECI is only available quarterly and is released with a ~2m lag (it is typically released around four weeks after the end of the quarter it is measuring).



Figure 2: Services CPI MoM (white line) is noisy. Wage growth is an important driver of services inflation but the Fed’s preferred measure of wage growth - the ECI (blue line) - although significantly smoother, is only available quarterly and with a ~2m lag.

Traditional (Government Data): Infer the Latent State from Lagged Outcomes

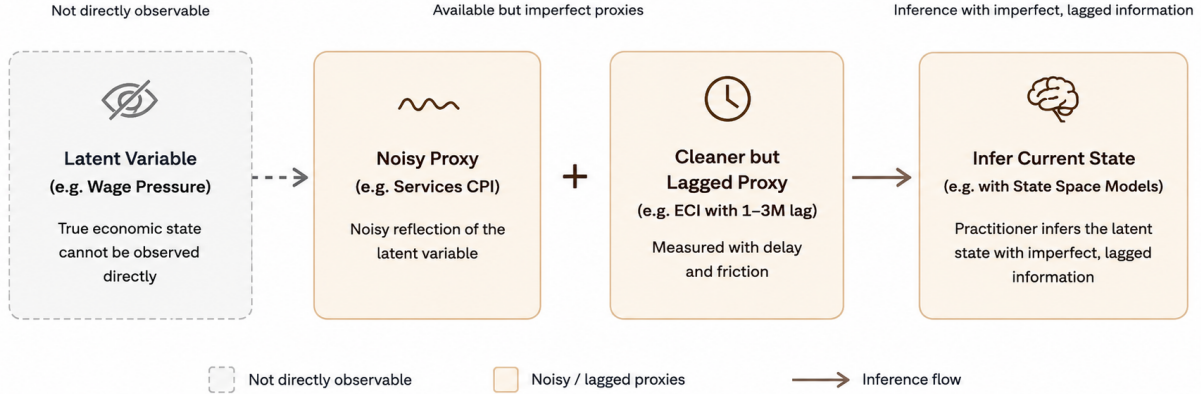


Figure 3: A schematic of the current inference process

Inflation prediction with alt. data and faster online goods prices are not enough

Inflation predictions using alternative data solve a different problem. They are helpful estimates - most useful for short-term traders who care about the accuracy and tradability first, and interpretability second. Being complex non-linear functions fitted via statistical learning (ML) methods to optimize predictive power, by design they are not meant to be interpretable. Ex-post methods like SHAP or LIME, along with a good track record may make trading practitioners more comfortable, but are unlikely to be fully convincing for an expert seeking to understand interpretable drivers.

The Billion Prices Project (BPP) by Cavallo and Rigobon was a significant innovation that scraped online prices - typically from large retailers in many countries in the world to estimate inflation in real-time. However, as Cavallo notes “*Online prices are typically more available for goods than all services and there might be a lag between online and offline prices.*” Finally, online prices are still prices and do not contain the underlying drivers that generate them.

3 MacroX’s Real-Time Approach to Inflation State Estimation

Rather than focusing on government data release prediction, our framework asks a different question: can we leverage many types of alternative data sources with millions of high-frequency observations to *directly* estimate the underlying state variable that government data will subsequently infer?

In this framing, traditional data then become an important validation mechanism, rather than the only source from which the current economic state must be inferred.

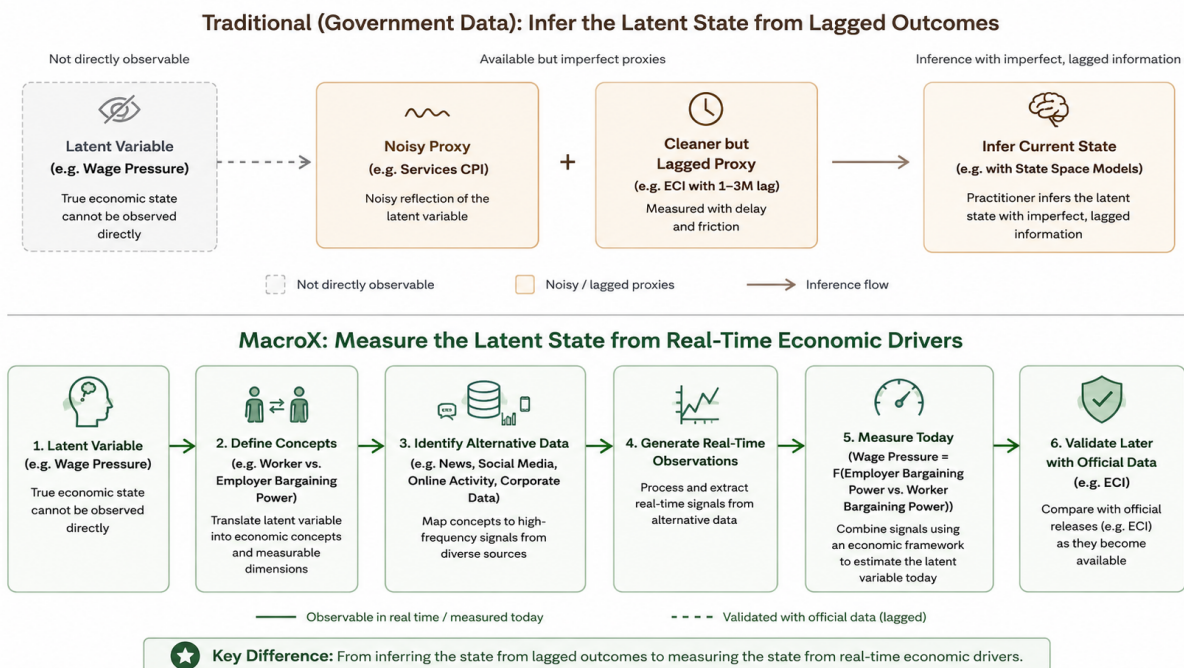


Figure 4: The MacroX process of directly measuring the latent state with alternative data

The distinction is subtle but important. We are not claiming that traditional economic releases are obsolete. They remain in the set of authoritative measurements against which our estimates can ultimately be evaluated. Our claim is narrower: where relevant state variables can be observed indirectly through sufficiently broad real-time data, investors may be able to estimate them earlier.

Wage Pressure Case Study: from Latent to Real-Time and Direct

In this section we work through one specific variable - wage pressure that drives services inflation. As noted earlier, the labor market is an important driver of services inflation as it affects important component of firms' cost structures, referenced by Fed officials, and faced with the trade-off between speedier but noisier Services CPI and smoother but two month's lagged Employment Cost Index.

MacroX approaches the problem differently. Rather than beginning with realized wage outcomes, we estimate the relative bargaining power of workers and employers.

When workers have outside options, vacancies are abundant, employers struggle to fill positions and retention becomes difficult, worker bargaining power increases. When labor demand weakens and available workers become more plentiful, employer bargaining power rises. Wages are one equilibrium outcome of this bargaining process.

MacroX therefore combines multiple dimensions of real-time labor-market data into worker and employer bargaining-power indicators, from which we derive a measure of wage pressure.

Worker vs. Employer Bargaining Power

Conceptually, we model wages as a market clearing outcome of worker and employer bargaining powers. When workers have more leverage, (all else equal) wages rise and when employers have the upper hand they can pay less. This is well-known economic theory but the ability of alternative data to granularly measure these concepts is new.

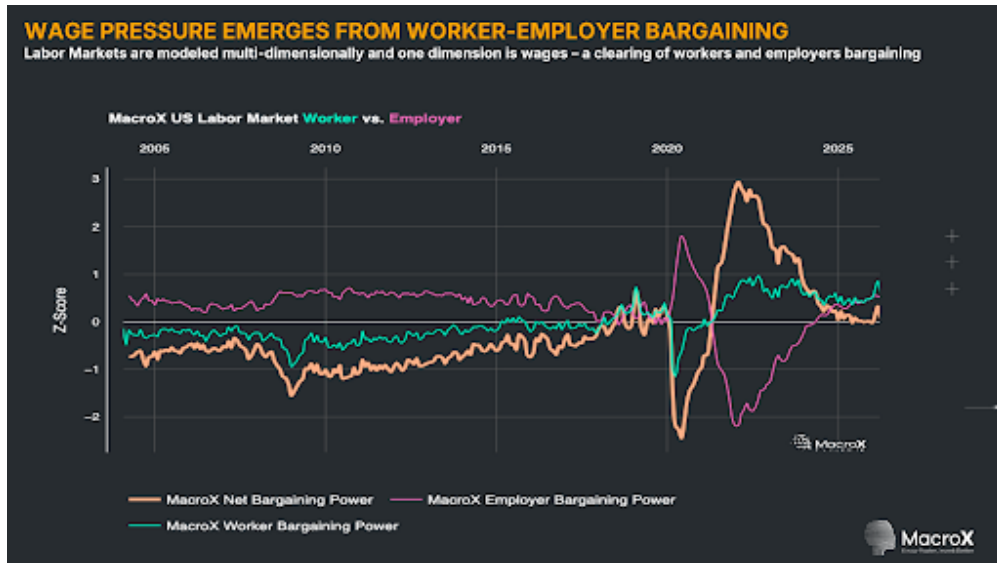


Figure 5: MacroX directly measures wage pressure in real-time by directly measuring the bargaining power of workers versus employers in the labor market

The MacroX engine integrates thousands of labor signals spanning flows, compensation, layoffs, financial stress, labor demand at metro-level granularity and aggregates up to the national level. This large sample size reduces the noise associated with survey sampling and by combining many types of data, the typical biases associated with specific data types are reduced. Finally, these concepts are matched with the carefully curated and widely accepted BLS data to ensure fidelity.

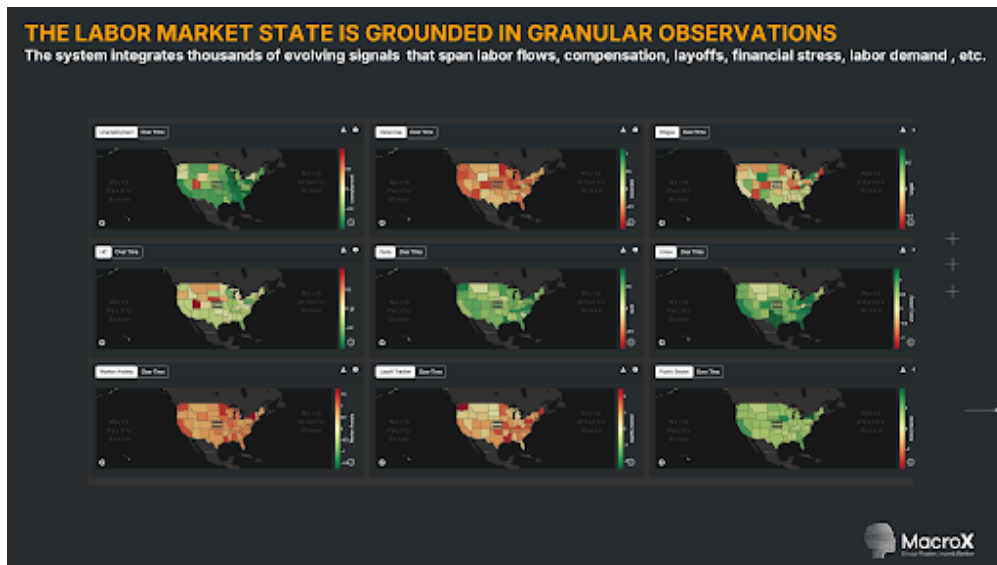


Figure 6: MacroX’s worker and employer bargaining power measures are generated by integrating thousands of labor signals spanning flows, compensation, layoff, financial stress, labor demand, etc.



Figure 7: MacroX's granular worker bargaining power detected labor market stress in the DC area related to DOGE ~2 weeks ahead of state or national IJC releases. This was an independent validation of the granular labor indicators that form the services inflation picture.

As a visual examination of Figure 8 suggests, because MacroX's measure of wage pressure (the green line) is real-time it is ~ 2 months faster than the "gold standard" Employment Cost Index (ECI) measured by the Bureau of Labor Statistics (BLS) (blue line). And this wage pressure measure captures the variation in trend in services CPI as well.

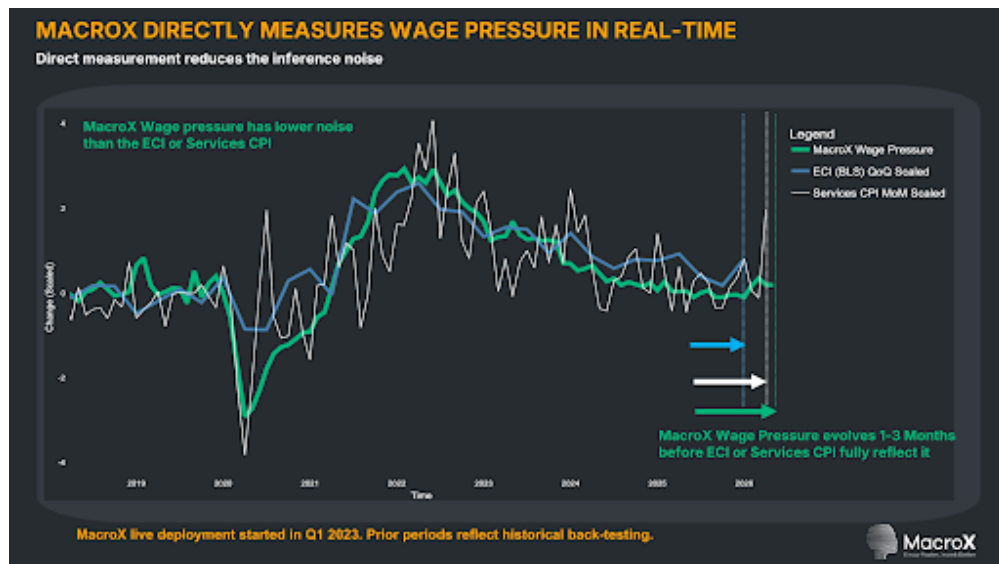


Figure 8: MacroX's measure is available in real-time, is monthly and leads the ECI by ~2m

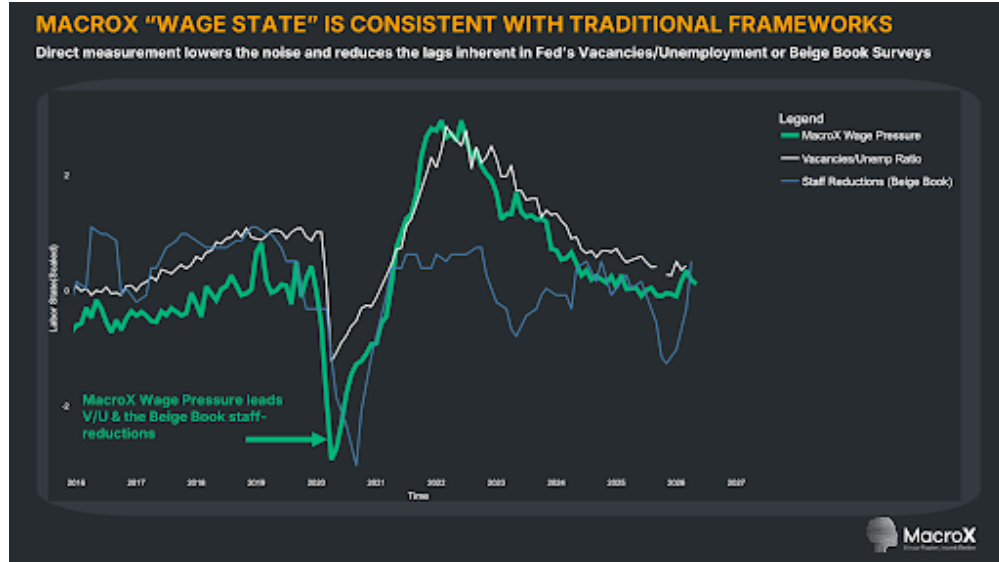


Figure 9: MacroX's wage pressure measure (green) relates to traditional measures like Vacancies/Unemployment and Fed Beige Book Staff Reductions but is available weekly in real-time.

For robustness, we provide two other pieces of evidence. First, MacroX's wage pressure measure (green) in Figure 9 relates to traditional measures like Vacancies/Unemployment and Fed Beige Book Staff Reductions but is available weekly in real-time¹. Second, the same wage pressure metric formulation explains wage growth in other countries - an example for the UK is shown in Figure 10, where this wage pressure explains UK wage growth and dominates Indeed Wage Tracker in a horse-race regression.

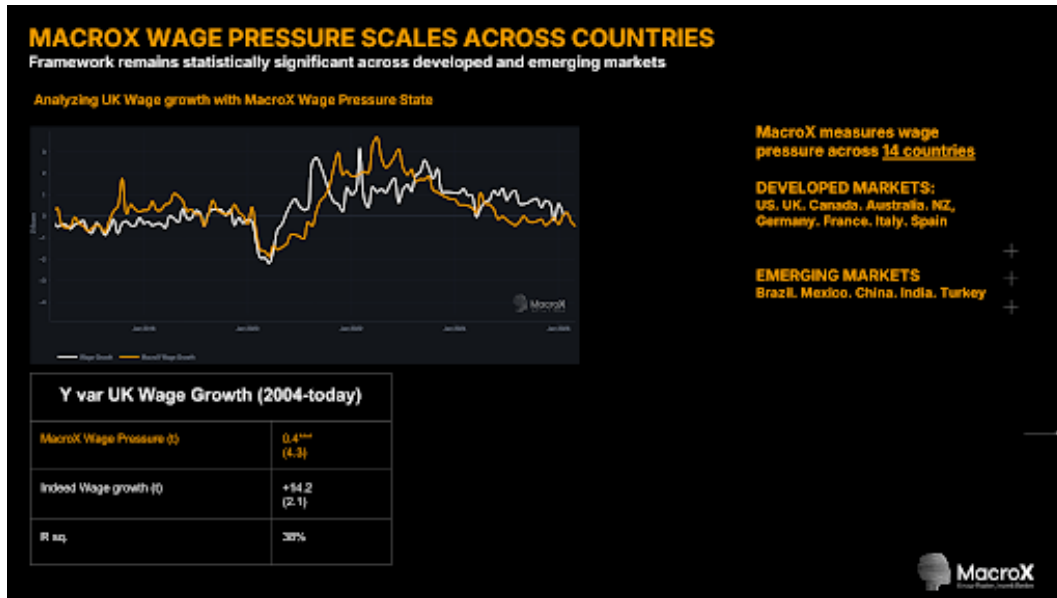


Figure 10: The same wage pressure formulation is significant in explaining the UK wage growth and is more significant than Indeed Wage tracker for the UK in horse-race regressions.

¹Regressions are significant but not provided here for brevity. They are available on request.

4 Does MacroX Contain Incremental Information?

Measuring What is Surprising to Economists

One way to measure incremental information is to see whether it is already embedded into the consensus of economists on Bloomberg. So we run two regressions as shown in the table below with the first regression measuring the relationship between changes in Core CPI to MacroX's aggregate demand (growth rate) and changes to wage pressure and the second doing the same thing but for Core CPI surprises that remove the information known to the consensus. Both MacroX Aggregate Demand changes and Wage Pressure changes are similarly significant for core CPI as well as surprises. MacroX's supply pressure was significant for CPI changes - so it helps model the concept but is not significant in the surprise regression suggesting that street economists are able to estimate it.

Table 1: Regression Results for Core CPI (t) (Monthly).

<i>Dep Var</i>	$\Delta \text{Core CPI } (t)$	$\Delta \text{Core CPI } (t)$ – <i>Consensus Est. (t)*</i>
	(1)	(2)
Constant	0.26*** (17.02)	0.0 (0.38)
MacroX Supply Pressure (t)	0.13*** (4.64)	0.02 (1.02)
Δ MacroX Growth (t)	0.12** (2.14)	0.11*** (2.88)
Δ MacroX Wage Pressure (t)	0.14** (2.19)	0.12*** (2.79)
Observations	108	108
R^2	33%	30%

* Consensus estimate of economists for CPI change is subtracted to focus on the market moving surprise element

Competing Alternative Data

A growing range of alternative wage measures is already available to investors. Indeed derives wage information largely from online job postings. ADP has access to payroll data. Revelio Labs uses large-scale labor-market and salary datasets.

These are useful benchmarks because a proprietary indicator that merely reproduces information already available from existing providers has limited value.

We therefore run horse-race regressions between MacroX and each competing real-time wage indicator in explaining subsequent variation in the Employment Cost Index. The available samples differ because the competing datasets begin at different dates: Indeed from 2019, ADP from 2020 and Revelio from 2022.

Exhibit 6 — Horse-race regressions explaining ECI

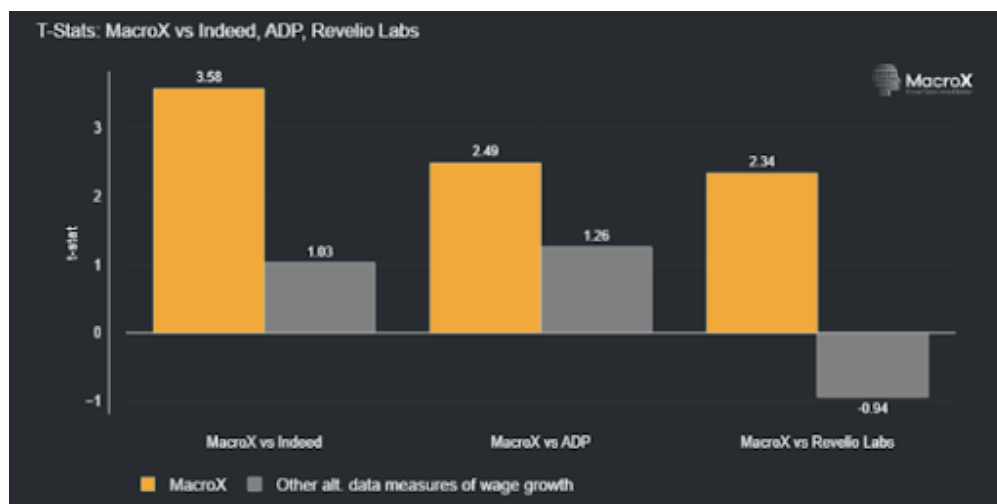


Figure 11: Comparing MacroX signals to leading alternative data providers. MacroX wage pressure remains significant when controlling for Indeed, ADP, and Revelio - t-stats confirm MacroX leads in every horse-race regression.

Table 2: Regression Results for $\Delta ECI(t)$ (Quarterly).

	Model 1 (2004-)	Model 2 (2019-)	Model 3 (2020-)	Model 4 (2022-)
Intercept	0.41*** (6.26)	0.77*** (5.23)	1.02*** (4.92)	0.91*** (3.12)
ECI QoQ(t-1)	0.45*** (5.25)	-0.01 (-0.10)	-0.51** (-2.18)	-0.07 (-0.20)
MacroX Wage Pressures(t)	0.11*** (5.09)	0.13*** (3.58)	0.15** (2.49)	0.16** (2.34)
Indeed Wage Tracker(t)		1.77 (1.03)		
ADP Pay Insights(t)			0.06 (1.26)	
Revelio Wage Growth QoQ(t)				-0.84 (-0.94)
Observations	85	25	18	13
R^2	68%	81%	76%	86%

Employment Cost Index $QoQ(t) \sim \text{Constant} + \text{MacroX Labor Nowcast}(t) + \text{Alternative Wage Tracker}(t) + \text{Employment Cost Index } QoQ(t-1)$.

Across these pairwise tests, MacroX retains statistical significance after controlling for the competing wage measure, while the alternative provider contributes substantially less incremental explanatory power.

This is a more important result than simple contemporaneous correlation. It suggests that MacroX is not merely reproducing the same information contained in existing wage trackers. It appears to contain incremental information about the wage state.

There are important limitations. The competing datasets have relatively short histories, particularly Revelio. Statistical relationships can change across macro regimes. And a historically informative state estimate does not automatically imply a profitable trade.

We therefore distinguish three separate questions:

1. Measurement — does MacroX estimate the underlying state earlier or more accurately?
2. Forecasting — does that information improve forecasts of subsequent macro outcomes?
3. Markets — is the information sufficiently different from consensus and market pricing to generate profitable positioning?

The wage regressions provide substantial evidence on the first question. Our live experience since 2023 provides encouraging—but necessarily shorter—evidence on the second and third.

5 The Full Inflation State

Full Inflation State - Real-Time Measurement

Wage Pressure is one inflation driver that we measure in real-time. Our model of the inflation state also encompasses most of the other factors which Fed officials refer to:

$$\text{Inflation} = f(\text{Demand} \cdot \text{Wages} \cdot \text{Supply} \cdot \text{Dollar} \cdot \text{Expectations} \cdot \text{Real-time Price}, \dots) \quad (1)$$

A “Wide Range” of Inflation Data

To validate if the MacroX factors correspond to central bankers’ real concerns, we used Claude to parse all speeches from the last 10 years of the FOMC where Fed officials described what drove inflation and Figure 12 notes the main elements that emerged.

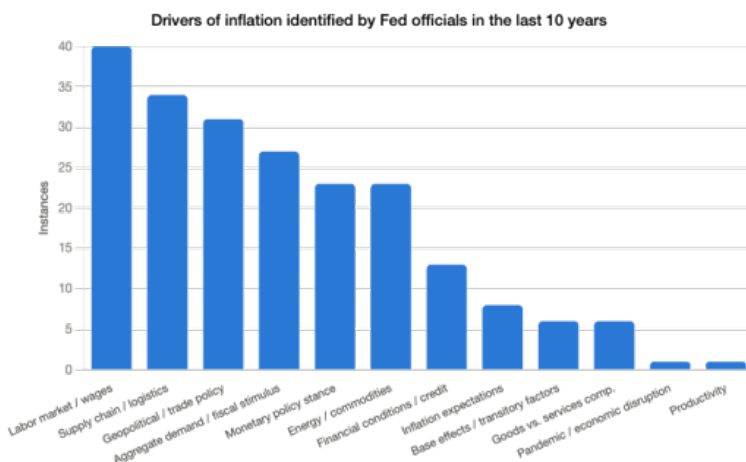


Figure 12: An AI-tool generated summary of the drivers of inflation identified by Fed officials over the past ten years in their key speeches

In keeping with economic theory, the labor market was the number one factor mentioned by Fed officials, with supply chains, geopolitics and aggregate demand following close behind. The specific factors from speeches, the typical measurement and then the corresponding MacroX factor are shown below.

Factors from Speeches	Typical Measurement	Typical MacroX Coverage	MacroX Lead
Labor Market/Wages	ECI, NFP, Unemployment Rate, AHE, JOLTS	MacroX Wage Pressure	1–3m
Supply Chain	GSCPI, Baltic Dry Index	MacroX Supply Pressure	0m
Aggregate Demand	GDP, PMI	MacroX Agg. Demand	1–3m
Commodities	Crude/Brent Oil, Natural Gas, Food	MacroX Energy and other Prices	0m
Financial Conditions	Asset Prices	MacroX Financial Anxiety, MacroX Energy Concerns, MacroX Aggregate Spend and MacroX Defaults	0–3m
Inflation Expectations	UMich, NYFed	MacroX Inflation Expectations	1m
Corporate Pricing Strategy	Inferred	MacroX Corporate Pricing Strategy	1–3m

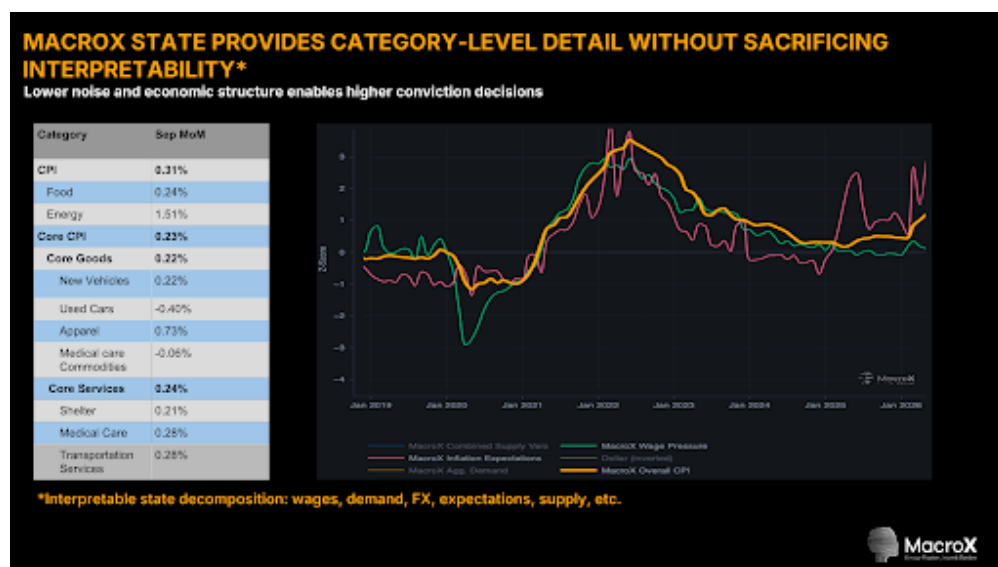


Figure 13: An example of the MacroX inflation State that provides the specific category level measurement but also interpretable State Variables such as real-time inflation expectation, and wage pressures. Note other state variables noted above are not shown here for clarity in the diagram.



Figure 14: The time series of US CPI with the white line being the government data and the golden line being MacroX.

6 The Current Energy Shock: What Would Persistent Inflation Look Like?

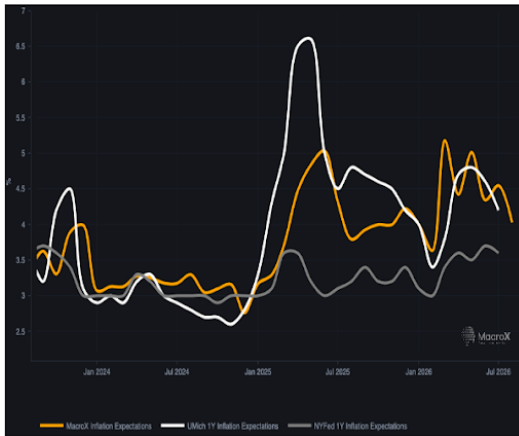
This framework is particularly relevant today. The immediate inflationary effect of higher energy prices is obvious. The harder question is whether the shock is becoming embedded in domestic inflation.

For that to occur, we would expect to see some combination of stronger worker bargaining power and accelerating wage pressure, materially higher medium-term inflation expectations, and more aggressive corporate pricing behaviour.

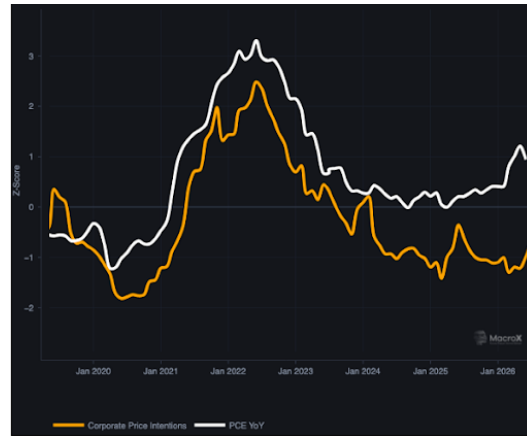


Figure 15: Most US Inflation drivers are contained and inflation is slowly declining

(a) MacroX Real-Time US Inflation Expectations (gold) continue to decline



(b) MacroX Corporate Strategy – price hike intentions(gold) are not elevated



(c) MacroX Real-Time Wage Pressures (gold) are declining, we believe that lagged ECI (white) will follow



Figure 16: Zooming in on the relevant drivers – real-time Inflation expectations are declining and current Corporate price hike intentions (gold) are substantially below the COVID era or Liberation Day peaks.

Those are precisely the second-round channels central banks are monitoring. We therefore broadly agree with policymakers on the model. Where we currently differ is the measurement of the state variables.

MacroX's real-time indicators presently give us less evidence that the energy shock is generating substantial domestic inflation persistence. That makes us less concerned than the current degree of central-bank hawkishness would imply.

This is not a permanent conclusion. It is explicitly falsifiable.

We would become more concerned if we observed a coordinated deterioration across the relevant state variables—for example:

- worker bargaining power turning materially higher;
- inflation expectations becoming persistently less anchored;
- firm pricing/markup indicators showing broad acceleration.

If those signals moved together, the probability that an external energy shock had become a domestic inflation process would rise materially. That is the advantage of a state-based framework: the macro view changes when the underlying state changes, rather than because one CPI print surprises by a tenth.

7 Live Track Record: From Macro View to Market View

A better measurement system is only economically valuable if it eventually changes a decision.

year	Big Macro Event	MacroX (live)	Actual
April 2023	US Recession	No recession	No recession, Fed raised rates in 2023
April – June 2024	Services Inflation too high. Fed can't cut	Inflation will fall	Core CPI fell from 3.8% in March 2024 to 3.2% in August, Fed cut 75bps
May – Sep 2025	April 2025 Liberation Day	Growth is stable, inflation isn't accelerating to 2021/22 levels	Fed revised up their growth projections and Core CPI/PCE YoY rose by $\leq 0.3\%$. Fed cut rates 75bps

Since MacroX went live in 2023, the framework has been tested through several large macro debates. In 2023, when recession risk was widely discussed, MacroX remained relatively constructive on US growth; the US avoided recession and the Fed subsequently continued tightening. During the 2024 debate over sticky services inflation, MacroX expected inflation pressure to decline; US core CPI subsequently fell materially and the Fed moved into an easing cycle. Following the 2025 tariff shock, MacroX judged that growth remained relatively stable and that inflation was unlikely to return to 2021–22 dynamics; subsequent inflation acceleration remained limited and the Fed ultimately cut rates.

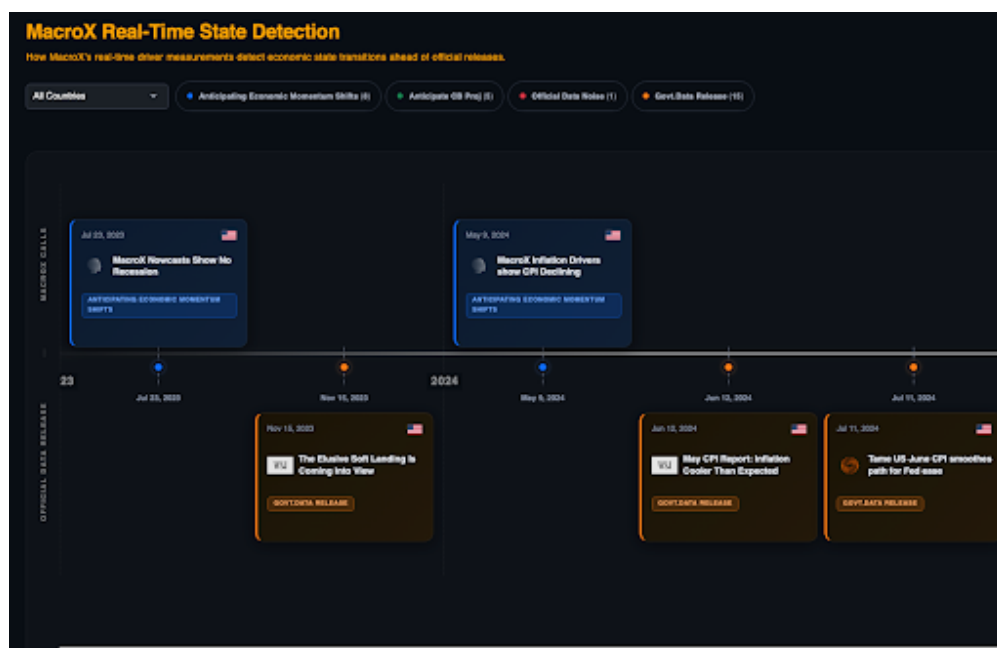


Figure 17: The full public track record for all countries is publicly available [here](#).

We regard these episodes as encouraging live evidence rather than a finished statistical track record.

The current energy-shock debate represents another live test.

Policy framework: central banks are right to focus on second-round effects.

Macro measurement: those second-round effects currently appear more contained than policy rhetoric suggests.

Policy implication: the probability of sustained additional tightening may therefore be lower than markets have periodically priced.

Market implication: where curves embed a substantial persistence premium, duration can offer an attractive expression of that disagreement.

That framework contributed to our recommendation to be long the UK 5-year Gilt during the recent repricing.

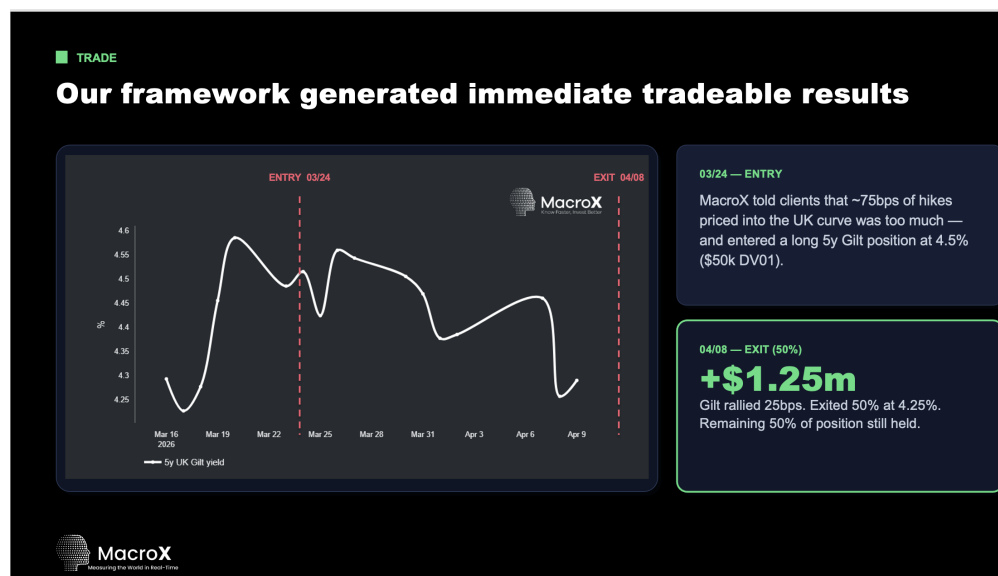


Figure 18: The full public track record for all countries is publicly available [here](#).

8 Conclusion

Estimating the true economic state which is not merely inflation outcomes but also the underlying drivers that can describe the causes and future inflation dynamics is a central problem. Inflation predictions with alternative data are typically optimized for prediction and not interpretability, and online price scraping, while a significant advance in speed for goods prices, is not designed to address the majority of underlying drivers such as wage pressures, inflation expectations, corporate pricing intentions that concern the experts.

In this article, we discussed how MacroX uses alternative data to directly measure important latent variables in real-time which are consistent with economic theory, are not priced by the consensus of economists, dominate well-known alternative data in horse-race regressions and have performed well in live testing over the last three years. New paradigms take time to refine and establish but we hope that the falsifiable claims and public performance will speed up the effort.

The current energy shock illustrates why that matters. Central banks are asking the correct question: will the shock generate second-round inflation? Our data currently suggest that second-round inflation shocks are less likely than current policy rhetoric implies. If wages, expectations and corporate pricing behaviour begin to tell a different story, our view should change with them.

That is ultimately the objective: not to forecast every release, but to identify changes in the economic state early enough for them to matter.

APPENDIX: System Architecture

The types of data sources consumed by the MacroX engine are presented below and their breadth mitigates the problem of non-representativeness or bias that might be typical in single source models.

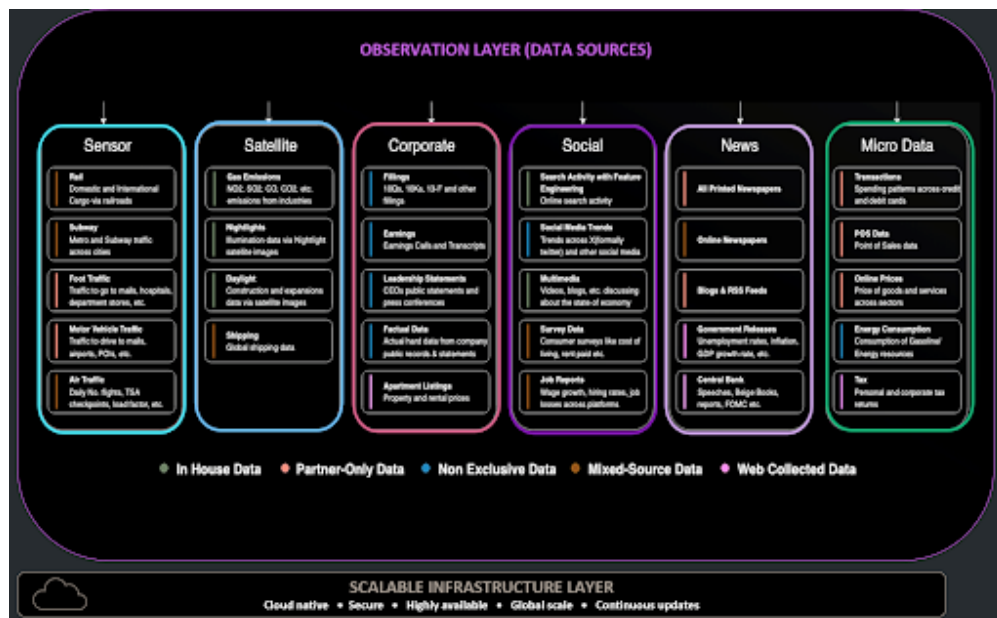


Figure 19: The major data source types consumed by the MacroX engine. The breadth and redundancy are crucial in delivering robust and less biased results.

The full architecture to maintain thousands of data sources and relevant pipelines is substantial and a diagram is presented in Figure 20.

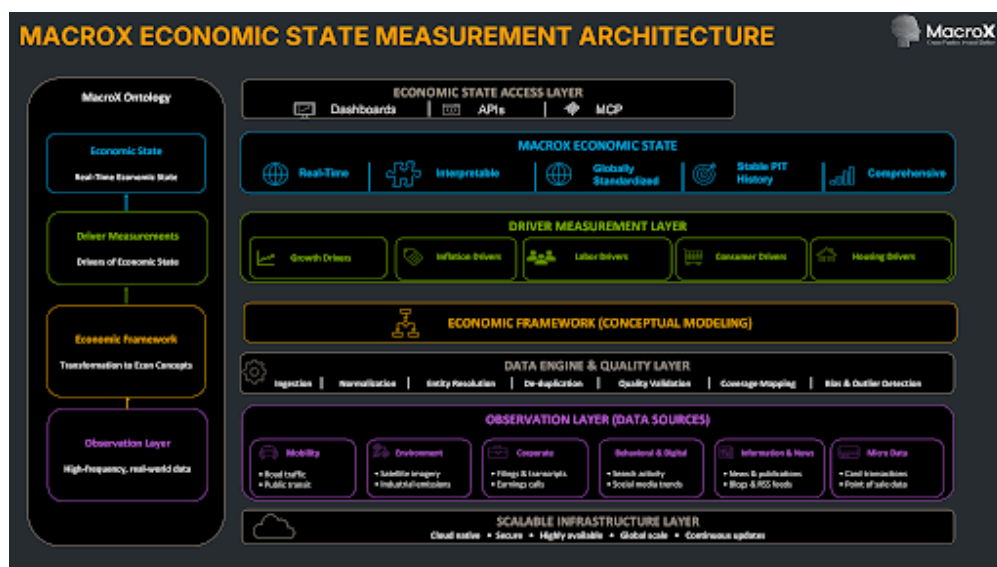


Figure 20: The system architecture diagram for MacroX's Engine