US Business Cycle Risk Report

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Finding the signal in the noise isn't getting any easier for assessing the state of the economy in real time. Two business-cycle indicators published last week highlights the challenge. On the dark side: the Conference Board's Leading Economic Index (LEI) continued to slide, falling in March to the lowest level since November 2020. The decline suggests that a recession, if not already underway, is just around the corner. *BCRR*'s ETI and EMI metrics have been telling similar stories for several months (see p. 2). The die, it seems, is cast. But another business cycle index just published begs to differ.

The S&P's US Composite PMI, a GDP proxy, extended its recovery in April, reflecting moderate growth, which reached an 11-month high. "Output rose at the sharpest pace for almost a year, as stronger demand conditions, improving supply and a steeper uptick in new orders supported the expansion," reports S&P Global.

Forward estimates of ETI and EMI through May also indicate that economic activity has been firming up after last year's economic slowdown reached a trough in January. As reported on these pages in recent weeks, the recovery in ETI and EMI still reflects a softer pace of decline lately (in contrast with moderate growth per PMI). The common theme: the recent downshift in the economy has reversed, suggesting that the coup de grace that turned the slowdown in recession has yet to arrive.

Despite the encouraging clues in some business-cycle indicators, it's still too early to confidently declare that the recession warning of late was a false signal. That verdict may yet prevail, but not yet. Rather, *BCRR* is still leaning toward what appears the more plausible view (for now): the recession call is premature or the downturn is (or will be) mild. The glitch in this narrative is the LEI's deeply negative reading.

How should we parse the conflicting readings? Our Composite Recession Probability Index (CRPI) is the worst solution, except when compared with everything else (see p. 9). By aggregating several business cycle indicators, CRPI doesn't attempt to favor a particular bias that infects all metrics that attempt to capture the ebb and flow of economic activity. On that note, CRPI continues to estimate a low level of recession risk following a moderate but still-undecisive rise earlier in the year.

This week's initial release of Q1 GDP (Thurs. Apr. 27) is expected to confirm that output continued to rise at a moderate pace. *BCRR*'s median nowcast is 2.0% (see p. 9), which matches the consensus point forecast, as reported by Econoday.com. Q2, by contrast, is still open for debate, but a softer expansion is a compelling guestimate until/if the incoming data say otherwise.

Mon, Apr 24 Chicago Fed Nat'l Activity Index (Mar), Dallas Fed Mfg Index (Apr)
Tues, Apr 25 Case-Shiller Home Price Index (Feb), Consumer Confidence Index (Apr), new home sales (Mar), Richmond Fed Mfg Index (Apr)
Wed, Apr 26 Durable goods orders (Mar), int'l trade in goods (Mar), wholesale/retail inventories (Mar)
Thurs, Apr 27 Jobless claims (wk 4/22), GDP (Q1), pending home sales (Mar)
Fri, Apr 28 Personal income & spending (Mar), Employment Cost Index (Q1), Chicago PMI (Apr), Consumer Sentiment Index (Apr)

Primary Business Cycle Indicators

Indicator: Date	Current Data	Recession Probability %	Page
ETI 3mo avg: Mar	50.00	15.8	2-3
EMI 3mo avg: Mar	-0.40	15.9	2-3
MMRI: Apr 21	-4.40	0.3	4
CFNAI-MA3: Feb	-0.13	10.1	5
ADS: Apr 15	0.08	0.5	6
CRPI: Apr 21		10.1	9

Indicator: Date	Current Data	Page
GDP: Q1 2023	2	10

Alternative Business Cycle Indicators

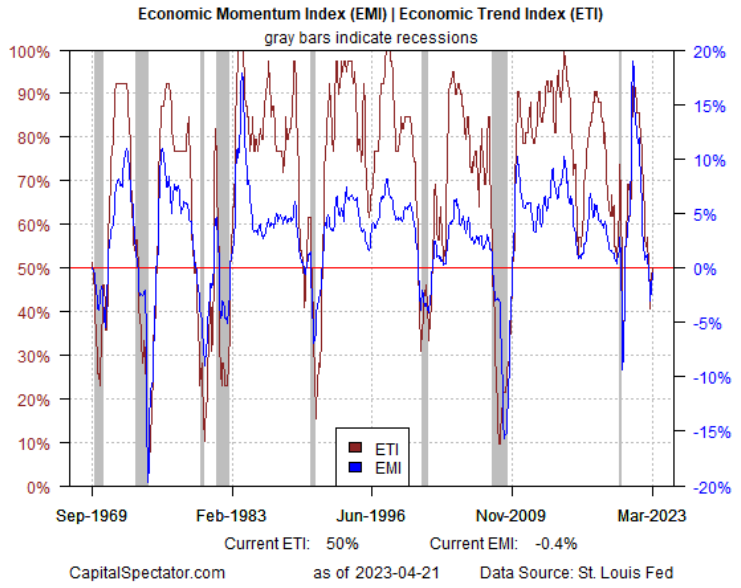
Indicator: Date	Current Data	Recession Probability %	Page
ETI monthly: Mar	50.00	12.5	2-3
EMI monthly: Mar	-0.10	12.6	2-3
CFNAI monthly: Feb	-0.19	8.7	5
WEI weekly: Apr 15	0.97	9.2	7
Short CRPI: Apr 21		12.6	8

Indicator: Date	Current Data	Page
MTI: Apr 15	-0.29	11

color code indicators	low risk	medium-high risk	neutral (MTI only)
See parameter rule definitions on p. 13	medium-low risk	high risk	

Key economic indicators: p. 12

ETI and EMI



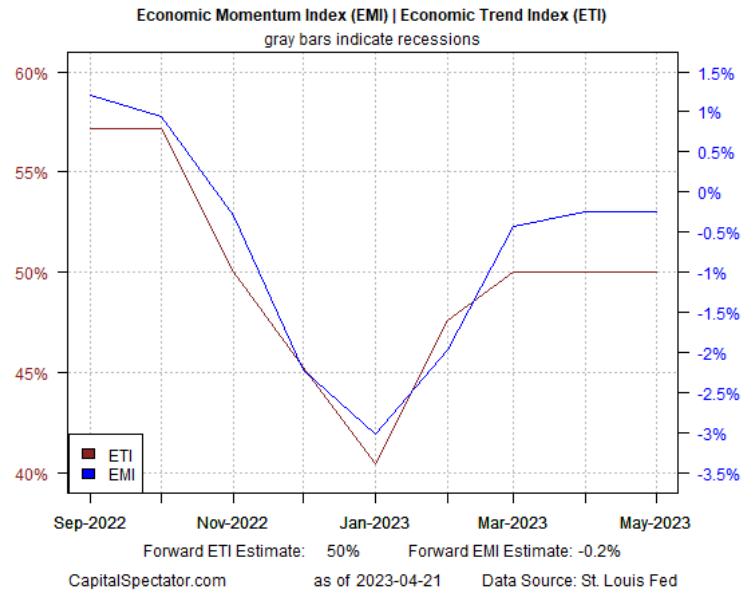
ETI is a diffusion index (i.e., an index that tracks the proportion of components with positive values) for the 14 leading/coincident indicators (see p. 11 ETI values reflect the 3-month average of the transformation rules defined in the table on p. 9. EMI measures the same set of indicators/transformation rules based on the 3-month average of the median monthly percentage change for the 14 indicators.

ETI values above (below) 50% align with growth (recession). EMI values above (below) 0% align with growth (recession).

The methodology for calculating ETI and EMI is detailed in:

Nowcasting The Business Cycle:
A Practical Guide For Spotting Business Cycle Peaks
(2014, Beta Publishing).

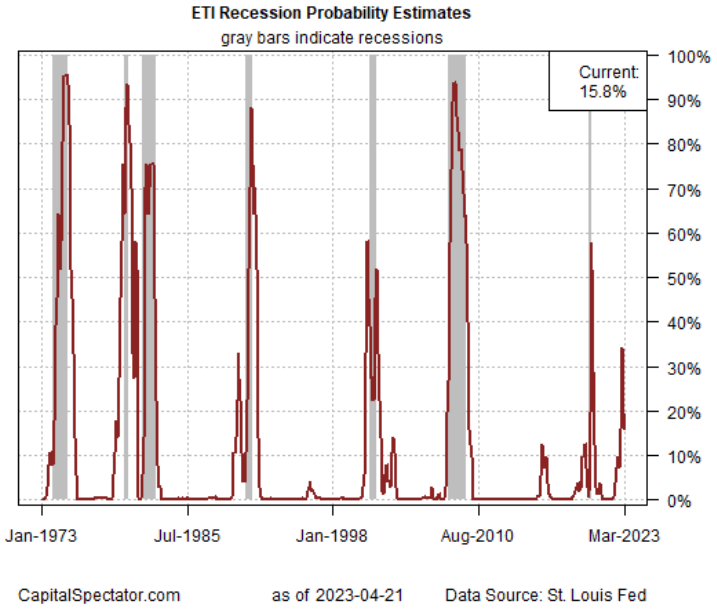
Near-term projections: ETI and EMI



For near-term projections of ETI and EMI, the missing data points are estimated with an ARIMA model.

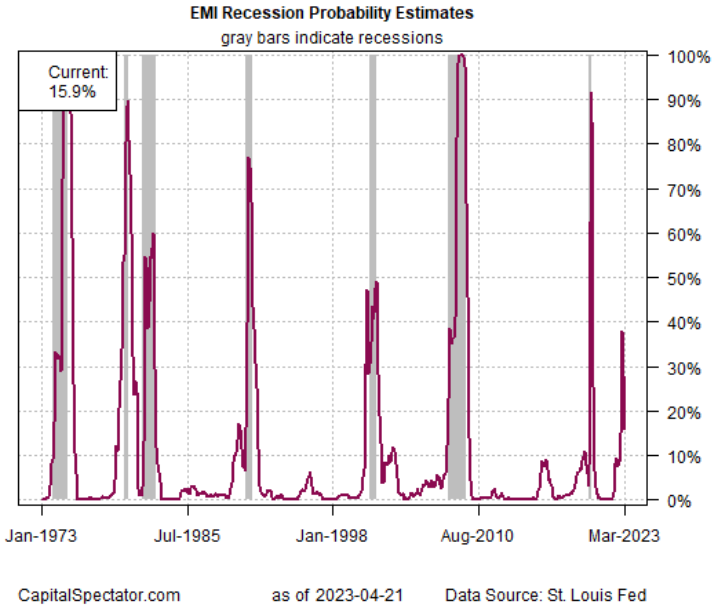
Forecasts are always suspect, of course, but recent projections of ETI & EMI for the near-term future have proven to be relatively reliable guesstimates vs. the full set of published numbers that followed. That's not surprising, given the broadly diversified nature of ETI & EMI. Predicting individual components, by contrast, is prone to far more uncertainty in the short run. The assumption here is that while any one forecast for a given indicator will likely miss the mark, the errors may cancel out to some degree by aggregating a broad set of predictions. That's a reasonable assumption based on the historical record for the forecasts.

Recession risk probability: ETI



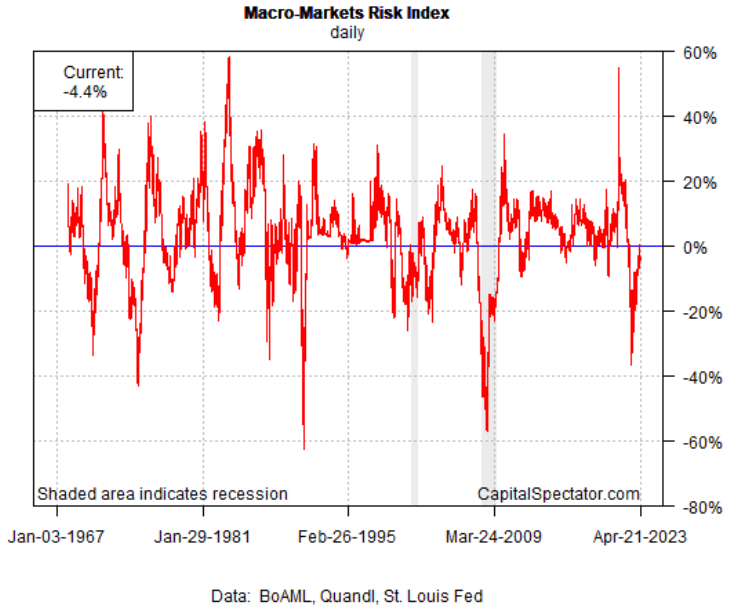
A probit model translates ETI's values into recession-risk probabilities on a monthly basis by comparing the index with the historical record of NBER's recession dates.

Recession risk probability: EMI



A probit model translates EMI's values into recession-risk probabilities on a monthly basis by comparing the index with the historical record of NBER's recession dates.

Macro-Markets Risk Index



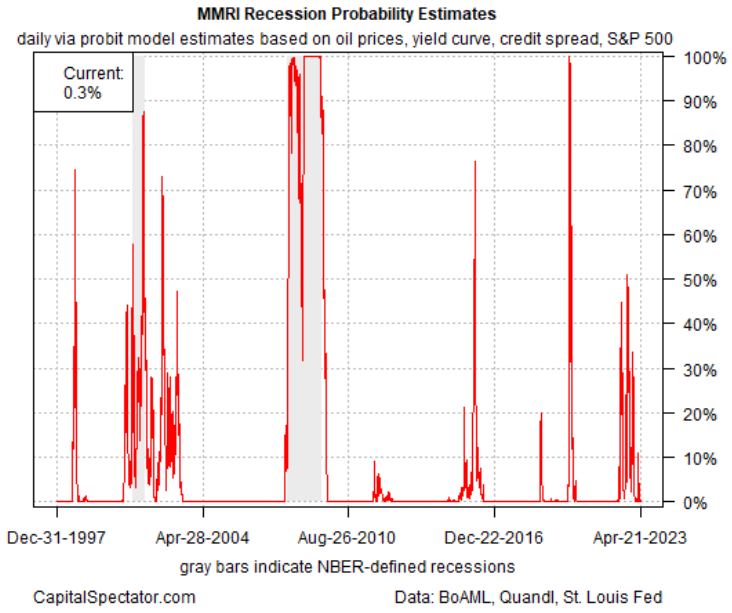
The Macro-Markets Risk Index (MMRI) is designed as a real-time proxy for business-cycle risk based on four data sets:

- ***US stocks** (S&P 500), 252-trading day % change*
- ***High yield credit spread** (BofA ML US High Yield Master II Option-Adjusted Spread) inverted 252-trading day % change*
- ***Treasury yield curve** (10-yr Treasury yield less 3-month T-bill yield)*
- ***Oil prices** (US benchmark: WTI) inverted 252-trading day % change*

Analyzing the market-price components of ETI and EMI separately offers a real-time approximation of macro conditions, according to the "wisdom of the crowd."

Why look to the financial and commodity markets for insight into the economic trend? Timely signals. Conventional economic reports are published with a time lag. This analysis is intended for use as a supplement for developing real-time perspective until a complete data set is published for updating the monthly economic profile.

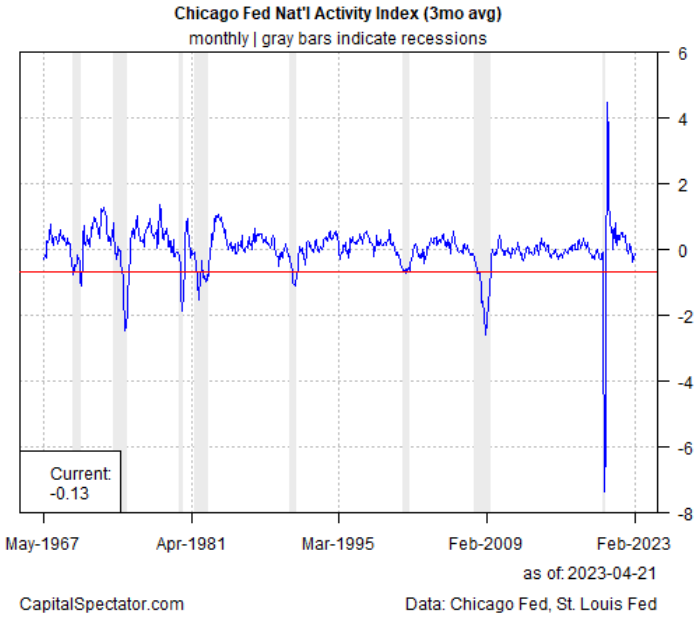
Recession risk probability: MMRI



A decline below 0% in MMRI (horizontal blue line in to chart at left) indicates that recession risk is elevated while readings above 0% imply that the economy will expand in the near-term future.

A probit model translates MMRI's values into recession-risk probabilities on a daily basis by comparing the index with the historical record of NBER's recession dates.

Chicago Fed Nat'l Activity Index



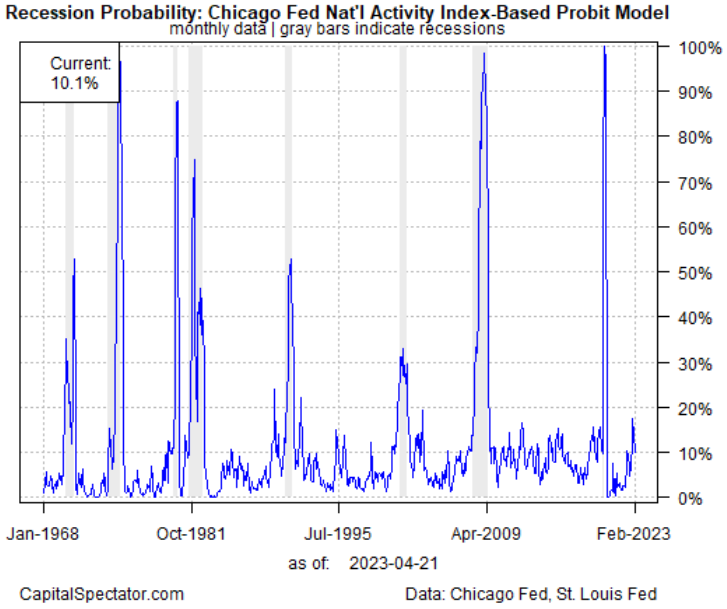
The Chicago Fed National Activity Index is a weighted average of 85 existing monthly indicators of national economic activity. It is constructed to have an average value of zero and a standard deviation of one. Since economic activity tends toward trend growth rate over time, a positive index reading corresponds to growth above trend and a negative index reading corresponds to growth below trend.

When the three-month moving average of the index (CFNAI-MA3) moves below –0.70 (horizontal red line in top chart at left) following a period of economic expansion, there is an increasing likelihood that a recession has begun. Conversely, when the CFNAI-MA3 value moves above –0.70 following a period of economic contraction, there is an increasing likelihood that a recession has ended.

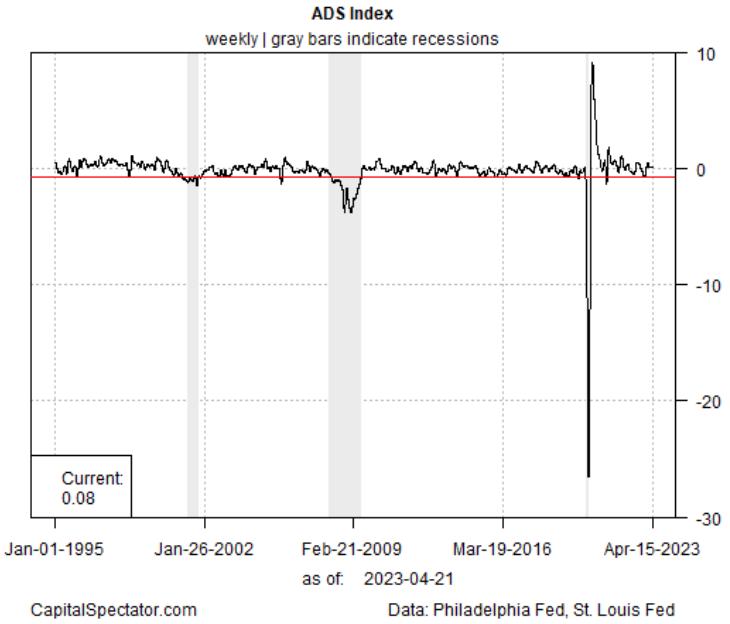
For additional information, see the Chicago Federal Reserve's web site: www.chicagofed.org

A probit model translates CFNAI-MA3 values into recession-risk probabilities on a monthly basis by comparing the index with the historical record of NBER's recession dates.

Recession risk probability: Chicago Fed Nat'l Activity Index



ADS Business Conditions Index



The Aruoba-Diebold-Scotti (ADS) Business Conditions Index is designed to track real business conditions at high frequency. Its underlying (seasonally adjusted) economic indicators (weekly initial jobless claims; monthly payroll employment, industrial production, personal income less transfer payments, manufacturing and trade sales; and quarterly real GDP) blend high- and low-frequency information and stock and flow data. The ADS Index is updated as data on the underlying components are released.

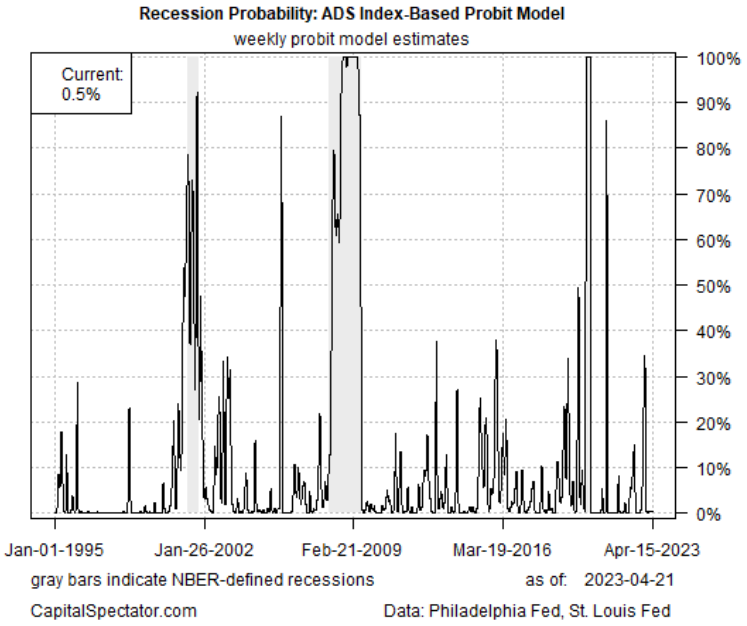
The average value of the ADS index is zero. Progressively bigger positive values indicate progressively better-than-average conditions, whereas progressively more negative values indicate progressively worse-than-average conditions. A value of -3.0, for example, would indicate business conditions significantly worse than at any time in either the 1990-91 or the 2001 recession, during which the ADS index never dropped below -2.0.

Analysis by the San Francisco Fed advises that the "optimal recession threshold" for the ADS Index is -0.80, indicated by the horizontal red line in the top chart at left. For details on this analysis, see: "Diagnosing Recessions" by Òscar Jordà in the Federal Reserve Bank of San Francisco Economic Letter (Feb. 10, 2010) at: www.frbsf.org

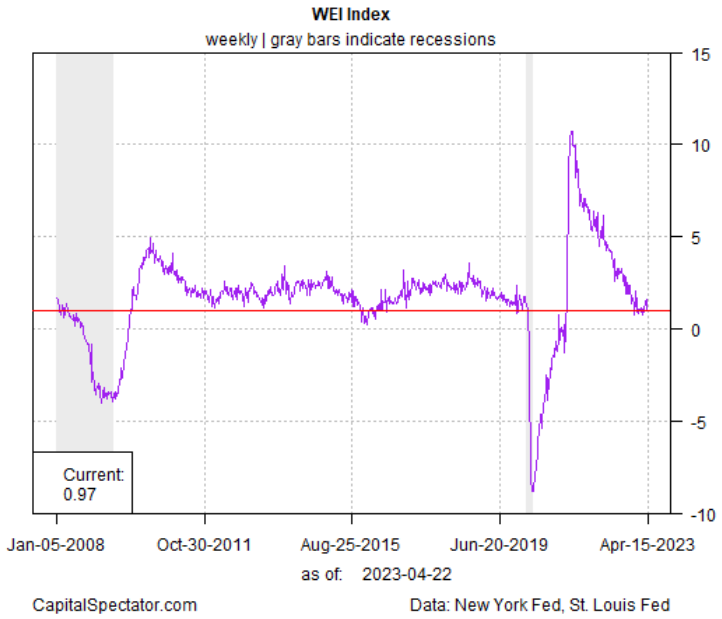
For additional information about the ADS Index, see the Philadelphia Federal Reserve's web site: www.philadelphiafed.org

A probit model translates ADS Index values into recession-risk probabilities on a daily basis by comparing the index with the historical record of NBER's recession dates.

Recession risk probability: ADS Business Conditions Index



Weekly Economic Index



The Weekly Economic Index (WEI) tracks real economic activity at a relatively high frequency. It's comprised of ten daily and weekly series covering consumer behavior, the labor market, and production.

The index's design was inspired by research published in 2013 by the Council of Economic Advisers: bit.ly/2VD05Oc

The New York Federal Reserve, which developed and maintains WEI, advises: "The WEI is scaled to the four-quarter GDP growth rate; for example, if the WEI reads -2 percent and the current level of the WEI persists for an entire quarter, we would expect, on average, GDP that quarter to be 2 percent lower than a year previously."

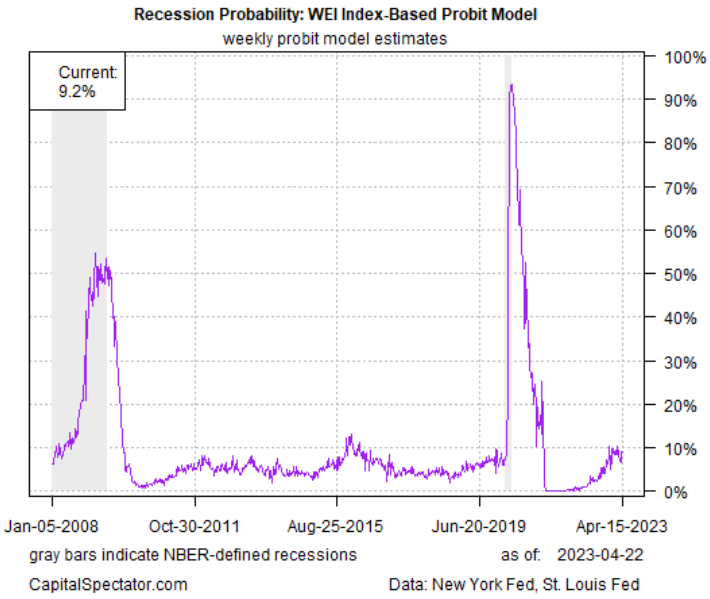
By that standard, WEI values below 1 (red line in top chart) suggest that a recession has started, based on reviewing the benchmark's history since 2008.

For additional information about the ADS Index, see the New York Reserve's web site:

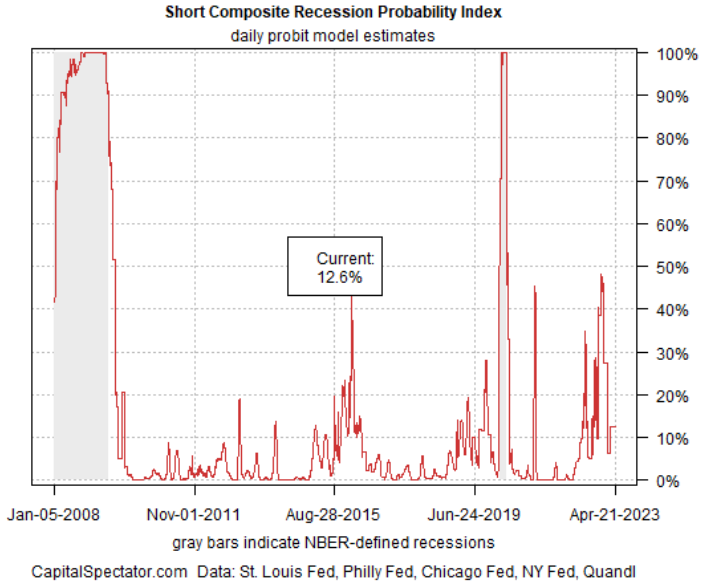
nyfed.org/35gnbO1

A probit model translates WEI values into recession-risk probabilities by comparing the index with the historical record of NBER's recession dates.

Recession risk probability: WEI Index



Recession risk probability: Short CRPI



The Short Composite Recession Probability Index (CRPI) reflects the median recession probability via probit modeling of the following indexes:

1. *ADS Index: (p. 6)*
2. *CFNAI (monthly) (p. 5)*
3. *Weekly Economic Index (p. 8)*
4. *MMRI (p. 4)*
5. *ETI (monthly) (pp 2-3)*
6. *EMI (monthly) (pp 2-3)*

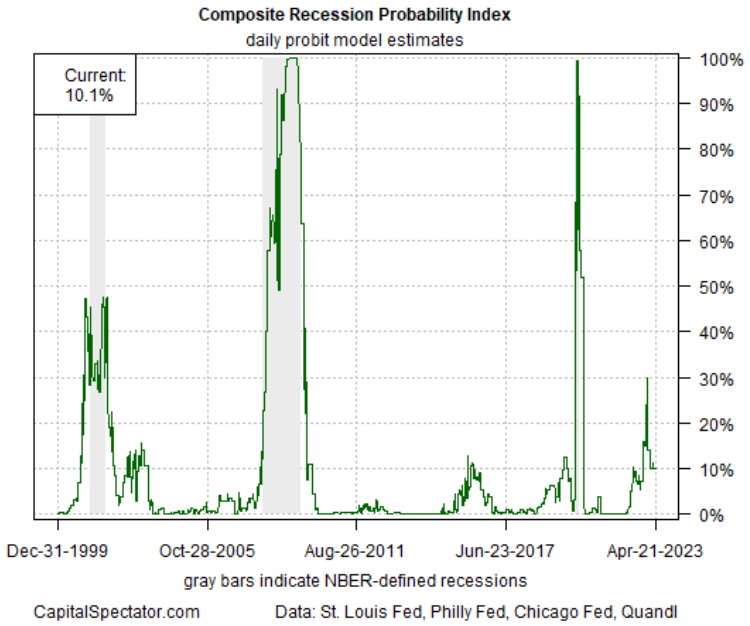
Short CRPI is designed as robust measure of US recession risk that's expected to benefit from the advantages of combining forecasts/nowcasts. The literature is long and deep in this niche, starting with "The combination of forecasts" by J. Bates and C.W.J. Granger in Operations Research Quarterly, *20:451-468, 1969.*

In contrast with the standard CRPI (p. 9), which is designed to estimate recession risk probability during the onset of a "normal" business cycle (in contrast with the sharp, sudden arrival of the Covid-19 triggered recession of 2020), the Short CRPI react quickly to shifting economic conditions.

Overall, combining forecasts/nowcasts typically delivers more reliable signals by reducing dependence on any one model. That's because every model is flawed in some degree. Combining the forecasts/nowcasts based on models with different assumptions, parameters, and inputs is a reasonably reliable methodology for improving output accuracy relative to any one forecast/nowcast from a single model.

*For details on the literature, see "Combining forecasts: A review and annotated bibliography" by Robert T. Clemen (*Journal of Forecasting, *5(4):559{583, 1989) and "Forecast combinations" by Allan Timmermann (*Handbook of Economic Forecasting, *1:135-196, 2006).*

Recession risk probability: CRPI



The Composite Recession Probability Index (CRPI) reflects the median recession probability via probit modeling of the following indexes:

1. *ETI (pp. 2-3)*
2. *EMI (pp. 2-3)*
3. *MMRI (p. 4)*
4. *CFNAI (p. 5)*
5. *ADS Index (p. 6)*

CRPI is designed as robust measure of US recession risk that's expected to benefit from the advantages of combining forecasts/nowcasts. The literature is long and deep in this niche, starting with "The combination of forecasts" by J. Bates and C.W.J. Granger in Operations Research Quarterly, *20:451-468, 1969.*

In contrast with the Short CRPI (p. 9), which is designed to react quickly to shifting economic conditions, the standard CRPI presented here is expected to provide a more reliable estimate of recession risk during "normal" business cycles, i.e., the onset of recessions that arise organically from standard macro and financial factors that prevailed prior to the Covid-19 triggered recession in 2020.

The main takeaway: combining forecasts/nowcasts typically delivers more reliable signals by reducing dependence on any one model. That's because every model is flawed in some degree. Combining the forecasts/nowcasts based on models with different assumptions, parameters, and inputs is a reasonably reliable methodology for improving output accuracy relative to any one forecast/nowcast from a single model.

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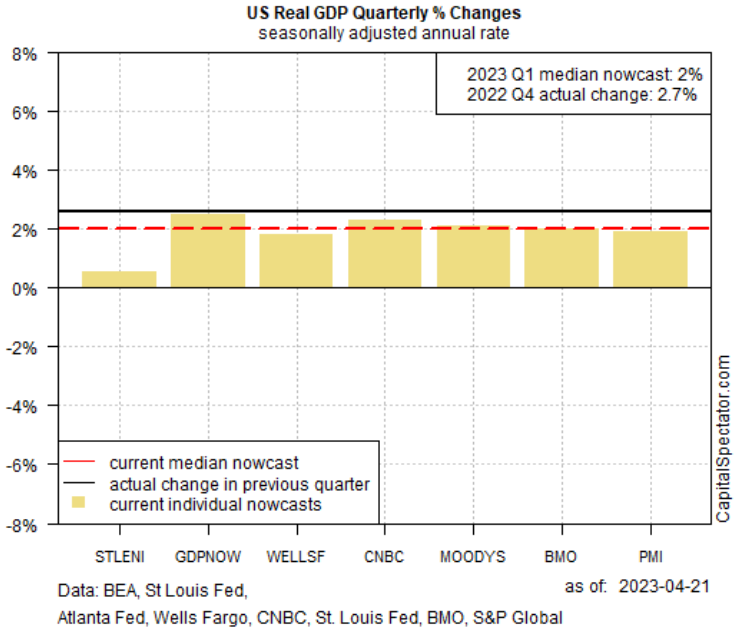
Gross Domestic Product Nowcasts



The chart at left summarizes several estimates of the quarterly % change for the next GDP report. For context, the current reported GDP % change for the previous quarter is shown, as calculated by the US Bureau of Economic Analysis (solid black line).

The GDP data doesn't formally factor into the econometric recession-risk estimates for BCRR*; rather, the GDP profiling is presented for additional context for assessing the near-term outlook for economic activity.*

The current projection reflects the median estimate of the following eight models based on the latest revisions:

STLENI: A nowcast model developed by St. Louis Fed. For details, see: stlouisfed.org

GDPNOW: a nowcast model developed by the Atlanta Fed. For details, see: frbatlanta.org

WELLSF: The current quarter's estimate from economists at Wells Fargo. For details, see: www.wellsfargo.com/com/insights/

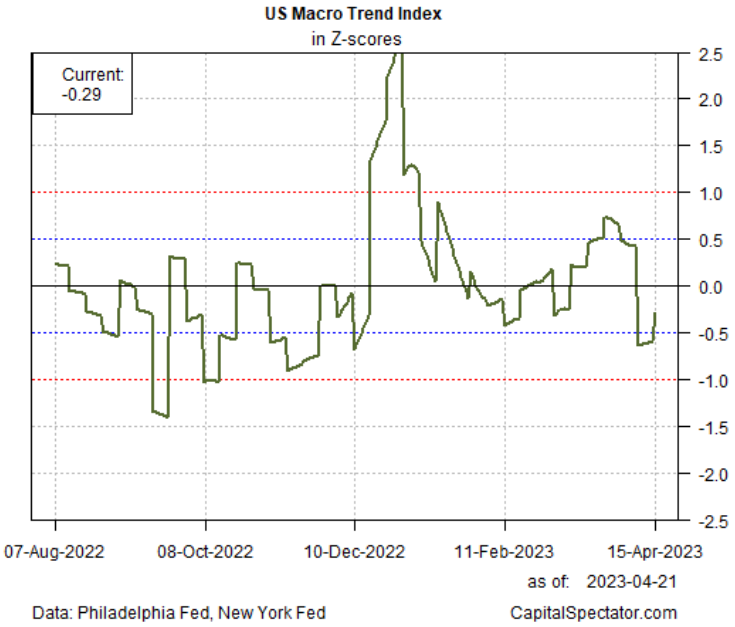
CNBC: The median estimate of Wall Street analysts via CNBC. For details, see: cnbc.com

MOODYS: Current quarter's estimate based on econometric model run by Moody's Analytics. For details, see: economy.com

BMO: Current quarter's estimate from economists at BMO. For details, see: economics.bmo.com

PMI: Current US Composite PMI, a survey-based GDP proxy that's updated monthly, published by S&P Global. For details, see: pmi.spglobal.com

US Macro Trend Index



The US Macro Trend Index (MTI) measures the strength of the directional bias of US economic activity. MTI reflects analysis of two business cycle indexes: ADS Index, published by the Philly Fed, and the Weekly Economic Index (WEI) via the New York Fed. Each index takes a different approach to monitoring US economic activity in real time, using a variety of indicators, some of which are published at daily and weekly frequencies. The goal with MTI is to quantify the degree of deceleration and acceleration in the overall macro trend via ADS and WEI. As such, MTI is not a measure of growth or contraction per se; rather, MTI is an index quantifying the strength or weakness of the overall trend.

MTI is a tool for developing context for assessing the overall strength or weakness of the current economic trend and quantifying the trend's evolution.

MTI is designed as follows:

1. Calculate the mean of the 1-, 2-, 5- and 10-period differences for ADS.
2. Calculate the mean of the 1- and 2-period differences for WEI.
3. Calculate the mean for 1 and 2; transform to Z-scores on a rolling 1-year basis.

Note: MTI is not used for any any other business-cycle calculations in US-BCRR.

For details on the underlying ADS and WEI indices, see:

tinyurl.com/yu4ncyav

tinyurl.com/dbtp8djx

ETI and EMI Component Indicators

US Economic Profile
April 23, 2023

	Indicator	Transformation	Jan-23	Feb-23	Mar-23	Apr-23
1	Labor Market Index [1]	1 yr % change	9.9%	3.5%	-0.5%	NA
1a	*Private non-farm payrolls*	*1 yr % change*	*3.5%*	*3.0%*	*2.8%*	*NA*
1b	*Initial Jobless Claims* [2]	*1 yr % chg (inverted)*	*16.0%*	*1.6%*	*-11.0%*	*-10.2%*
1c	*Employ.-to-Unemploy. Ratio*	*1 yr % change*	*16.5%*	*7.5%*	*3.9%*	*NA*
1d	*Index of Agg. Weekly Hours* [3]	*1 yr % change*	*3.6%*	*1.9%*	*2.1%*	*NA*
2	US Stock Market (S&P 500) [2]	1 yr % change	-13.4%	-8.0%	-9.6%	-6.1%
3	Real personal income ex current transfer receipts	1 yr % change	1.6%	1.6%	NA	NA
4	ISM Manufacturing Index	% +/- neutral: 50 [5]	-5.2%	-4.6%	-7.4%	NA
5	Spot Oil (W. Tex. Intermed.) [2]	1 yr % chg (inverted)	6.1%	16.2%	32.5%	20.1%
6	Consumer Spending Index [6]	1 yr % change	1.9%	1.2%	-1.9%	NA
6a	*Real Pers. Cons. Expend.*	*1 yr % change*	*2.7%*	*2.5%*	*NA*	*NA*
6b	*Real Retail Sales*	*1 yr % change*	*1.2%*	*-0.1%*	*-1.9%*	*NA*
7	Treasury Yield Curve (10 yr Note less 3 mo T-bill) [2]	current monthly spread [7]	-10.1%	-9.0%	-10.3%	NA
8	High-Yield Bond Spread (BofA ML US HY Option-Adjusted Spread) [9]	1 yr % chg (inverted)	-34.7%	-15.2%	-23.8%	-25.5%
9	Real Monetary Base (M0)	1 yr % change	-17.9%	-16.9%	NA	NA
10	University of Michigan Consumer Sentiment Index	1 yr % change	-3.4%	6.7%	4.4%	-2.6%
11	Industrial Production	1 yr % change	1.4%	0.9%	0.5%	NA
12	New Residential Bldg. Permits	1 yr % change	-27.3%	-16.5%	-24.8%	NA
13	Real Mfg. & Trade Sales [8]	1 yr % change	-0.6%	NA	NA	NA
14	ISM Non-Mfg. Index [4]	% +/- neutral: 50 [5]	20.8%	12.6%	10.8%	NA

1. Average 1-year % changes of payrolls, jobless claims, employed-to-unemployed ratio, and weekly hours index.
2. Average monthly data based on daily closes.
3. Production and Nonsupervisory Employees: Total Private Industries.
4. Data series begins Jan. 2008.
5. A neutral reading is assumed to be 50. The transformation is calculated as the % deviation for each monthly reading relative to 50.
6. Average of 1-year % changes for real personal consumption expenditures & real retail sales.
7. Monthly difference: 10yr less 3mo % rates, multiplied by 10.
8. Manufacturing & wholesale sales via BEA. Note: retail sales excluded.
9. Average monthly data. Moody's BAA-AAA spread through Nov-1997, HY spread data thereafter.

Note: The Labor Market Index is considered as 1 indicator, comprised of the four indicators in green cells. The same applies to the Consumer Spending Index, which is comprised of 2 indicators.

NA = data not yet available from source

CapitalSpectator.com

The Economic Trend & Momentum indexes are aggregates of 14 economic and financial indicators, as shown in the table at left. A complete data set for each month tends to lag by one to three months, depending on the indicator. Manufacturing and trade sales suffer the longest lag. By contrast, the market figures are available in real time.

To calculate ETI and EMI in the graphs and analysis above, missing data points must be estimated. To fill in the missing data points, an ARIMA model is used.

Standard Methodology Parameter Rules for Summary Table on Page 1:

Business Cycle Index Values							GDP
		ETI	**EMI**	**MMRI**	**CFNAI**	**ADS**	**Nowcast**
	low risk	>80%:100%	> 5%	> 5%	> 0.2	> 0.2	> +3.5%
	medium-low risk	55%:80%	1%:5%	0%:5%	-0.2:+0.2	-0.2:+0.2	+1.5%:+3.5%
	medium-high risk	45%: < 55%	-1%: < 1%	-5%: < 0%	-0.7: < -0.2	-0.8: < -0.2	0%:<+1.5%
	high risk	< 45%	< -1%	< -5%	< -0.7	< -0.8	<0%

Recession Risk Probability Estimates							
		ETI	**EMI**	**MMRI**	**CFNAI**	**ADS**	**CRPI**
	low risk	0%:10%					
	medium-low risk	> 10%:30%					
	medium-high risk	> 30%:50%					
	high risk	> 50%					

Short-Focus Methodology Parameter Rules for Summary Table on Page 1:

Business Cycle Index Values							
		WEI weekly	**ETI monthly**	**EMI monthly**	**MMRI**	**CFNAI monthly**	**ADS**
	low risk	>3	>80%:100%	> 5%	> 5%	> 0.2	> 0.2
	medium-low risk	2:3	55%:80%	1%:5%	0%:5%	-0.2:+0.2	-0.2:+0.2
	medium-high risk	1:2	45%: < 55%	-1%: < 1%	-5%: < 0%	-0.7: < -0.2	-0.8: < -0.2
	high risk	<1	< 45%	< -1%	< -5%	< -0.7	< -0.8

Recession Risk Probability Estimates								
		WEI weekly	**ETI**	**EMI**	**MMRI**	**CFNAI**	**ADS**	**CRPI**
	low risk	0%:10%						
	medium-low risk	> 10%:30%						
	medium-high risk	> 30%:50%						
	high risk	> 50%						

MTI Risk Probability Estimates		
	low risk	> +1.0
	medium-low risk	> +0.5: +1.0
	neutral	+0.5: -0.5
	medium-high risk	< -0.5: -1.0
	high risk	< -1.0