METHODOLOGY
20 AUGUST, 2020

Moody's Analytics & CNN Business Back-to-Normal Index

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INTRODUCTION

Moody's Analytics and CNN Business have partnered to create a proprietary Back-to-Normal Index intended to measure the status of the economic recovery from the COVID-19 crisis. The index uses a mix of traditional economic data and real-time metrics being published by a host of private providers to capture trends both nationally and at a state level. The index is intended to go beyond the usual measures of employment and output to give a realistic sense of how businesses and consumers are responding to the pandemic.

Moody's Analytics & CNN Business Back-to-Normal Index

BY MARK ZANDI, DANTE DEANTONIO AND MATT COLYAR

Moody's Analytics and CNN Business have partnered to create a proprietary Back-to-Normal Index intended to measure the status of the economic recovery from the COVID-19 crisis. The index uses a mix of traditional economic data and real-time metrics being published by a host of private providers to capture trends both nationally and at a state level. The index is intended to go beyond the usual measures of employment and output to give a realistic sense of how businesses and consumers are responding to the pandemic.

Data

The data included in the index are published by a variety of public and private entities and are released at varying frequencies (see Table 1).

The included data are intended to capture a wide range of economic activity including traditional measures of output and labor market activity, travel and leisure activity, housing market activity, and consumer behavior.

The Moody's Analytics high frequency GDP model serves as the foundation of the index, as it broadly measures total economic output using traditional measures of economic activity. The model produces a point-

TABLE 1

Frequency	Indicator	Source	Transformation
Daily	High frequency GDP model*	Moody's Analytics	% chg from Mar 1
	Seated restaurant diners	OpenTable	% chg yr ago
	Workplace mobility index	Google	% chg from Jan 3-Feb 6
	Airline checkpoint traveler throughput	Transportation Safety Administration	% chg from Mar 1
	Hrs worked - small businesses	Homebase	% chg from Jan 4-Jan 31
	New-home postings	Zillow	% chg from Mar 1
Weekly	U.S. petroleum products supplied (bpd)	Energy Information Administration	% chg from Mar 1
	Railroad traffic: Intermodal traffic (trailers & containers)	Association of American Railroads	% chg from Mar 1
	Unemployment insurance: Continuing claims	Employment & Training Administration	Peak set to -100%**
	MBA Applications Survey: Activity index - purchase	Mortgage Bankers Association	% chg from Mar 1
	Business Confidence Index: North America	Moody's Analytics	% chg from Mar 1
	Johnson Redbook Index: Same-Store - all	Redbook Research Inc.	% chg yr ago
Monthly	Employment	Bureau of Labor Statistics	% chg from Mar 1

*A full listing of the source data for the high frequency GDP model can be found in the Appendix.
**Unemployment insurance claims require further transformation for inclusion in the index. UI claims rise during business cycle downturns, while all other measures decline. Simply taking the positive percentage change since Mar 1 and reversing the sign overweights the value of UI claims in the index, as it has risen by more than 1,000% over that period. Instead, the peak of UI claims is set to a 100% decline, and all other values are calculated relative to that point. Continuing claims include both regular state claims as well as continuing claims made under the Pandemic Emergency Unemployment Compensation program, which extended the duration of regular state benefits.

Source: Moody's Analytics

TABLE 2

Frequency	Indicator	Source	Transformation
Daily	National-level Back-to-Normal index	Moody's Analytics, CNN Business	N/A
	Seated restaurant diners	OpenTable	% chg yr ago*
	Workplace mobility index	Google	% chg from Jan 3-Feb 6
	Hrs worked - small businesses	Homebase	% chg from Jan 4-Jan 31
	New-home postings	Zillow	% chg from Mar 1
Weekly	Unemployment insurance: Continuing claims	Employment & Training Administration	Peak set to -100%**
Monthly	Employment	Bureau of Labor Statistics	% chg from Mar 1

*OpenTable data on seated diners are available only for 36 states and the District of Columbia. In the remaining 14 states, an avg of neighboring and/or comparable states is used in its place.
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Source: Moody's Analytics

in-time estimate of real GDP using the same source data the Bureau of Economic Analysis ultimately uses to calculate its official estimates of GDP. As a quarter progresses, newly released monthly data are fed into the current-quarter model to estimate GDP. The high frequency GDP model captures a wide range of economic data, including industrial production, inventories, business and consumer prices, value of trade, energy demand and prices, construction spending and retail sales, among others (see Appendix). The model is updated at a daily frequency with estimated GDP changing only when new source data have been released.

Methodology

The index is designed to broadly measure economic activity relative to pre-COVID-19 levels. To do this, the input data are transformed to percentage changes relative to March 1 levels, where possible. A few of the indicators are published only in year-over-year transformations, and others are published as percentage changes relative to a base period other than March 1. These exceptions are included in the index as published and are detailed in Table 1.

To calculate the index at a daily frequency, all nondaily input data are imputed to a daily frequency by carrying forward the last available datapoint. For example, an indicator published weekly will have the same value input over the course of seven days until the next weekly datapoint is published. Once converted to a daily frequency, all data are smoothed using a seven-day moving average. This helps to eliminate the weekday/weekend fluctuations in some of the daily data and works to smooth the transitions of the weekly data.

National-level index

In general, the index components at the national level are given equal weight when calculating the index with one exception. Given that the Moody's Analytics high frequency GDP model incorporates 25 traditional economic indicators, it is given higher than average weight in the model. However, the amount of information contained in the model is balanced against the fact that it incorporates data released at a monthly frequency, which means that it is more lagged than most other measures being used. Under an equal weighting setup, each of the 13 components would be weighted at 7.7%. Instead, the high frequency GDP model is given 15% weight, and the remaining components are each given 7.1% weight. After weighting, the index is rescaled so that when all indicators are at their pre-COVID-19 levels, the index is equal to 100.

State-level index

Only a subset of the indicators used to construct the national index is available at a state level. To account for this difference and broader national trends, the national-level index is included as a component of each state index (see Table 2).

Given the greater breadth of real-time data available nationally, the national-level index is given 25% weight in the calculation of each state index. All other metrics are given equal weight (12.5% each) in the construction of the state-level indexes. Otherwise, the data transformations and methodology are identical to the national index.

An additional adjustment is needed to ensure consistency between the national- and state-level indexes given the differences in included data. The raw state-level indexes are estimated independently using available data and then ratio-adjusted so that the population-weighted state level indexes align with the national index. This process ensures comparability between the national- and state-level indexes while maintaining the relationship among states.

Appendix: Moody's Analytics High Frequency GDP Model

Indicator	Source
Vehicles sales	AutoData
Construction spending	Census Bureau
Retail sales	Census Bureau
Retail sales, building materials	Census Bureau
Retail sales ex auto, building, gas	Census Bureau
Gasoline prices & sales	Energy Information Administration
Gasoline product supplied	Energy Information Administration
Exports	Census Bureau
Imports	Census Bureau
Import prices	Bureau of Labor Statistics
Producer prices	Bureau of Labor Statistics
Business inventories	Census Bureau
Consumer price index	Bureau of Labor Statistics
Core CPI	Bureau of Labor Statistics
Industrial production	Federal Reserve Board
Utility output	Federal Reserve Board
Durable goods	Census Bureau
Factory orders	Census Bureau
Nominal personal income	Bureau of Economic Analysis
Nominal consumption	Bureau of Economic Analysis
Nominal consumption, durables	Bureau of Economic Analysis
Nominal consumption, nondurables	Bureau of Economic Analysis
Nominal consumption, services	Bureau of Economic Analysis
PCE deflator	Bureau of Economic Analysis
Core PCE deflator	Bureau of Economic Analysis

Source: Moody's Analytics

About the Authors

Mark Zandi is chief economist of Moody's Analytics, where he directs economic research. Moody's Analytics, a subsidiary of Moody's Corp., is a leading provider of economic research, data and analytical tools. Dr. Zandi is a cofounder of Economy.com, which Moody's purchased in 2005.

Dr. Zandi's broad research interests encompass macroeconomics, financial markets and public policy. His recent research has focused on mortgage finance reform and the determinants of mortgage foreclosure and personal bankruptcy. He has analyzed the economic impact of various tax and government spending policies and assessed the appropriate monetary policy response to bubbles in asset markets.

A trusted adviser to policymakers and an influential source of economic analysis for businesses, journalists and the public, Dr. Zandi frequently testifies before Congress on topics including the economic outlook, the nation's daunting fiscal challenges, the merits of fiscal stimulus, financial regulatory reform, and foreclosure mitigation.

Dr. Zandi conducts regular briefings on the economy for corporate boards, trade associations and policymakers at all levels. He is on the board of directors of MGIC, the nation's largest private mortgage insurance company, and The Reinvestment Fund, a large CDFI that makes investments in disadvantaged neighborhoods. He is often quoted in national and global publications and interviewed by major news media outlets, and is a frequent guest on CNBC, NPR, Meet the Press, CNN, and various other national networks and news programs.

Dr. Zandi is the author of *Paying the Price: Ending the Great Recession and Beginning a New American Century*, which provides an assessment of the monetary and fiscal policy response to the Great Recession. His other book, *Financial Shock: A 360º Look at the Subprime Mortgage Implosion, and How to Avoid the Next Financial Crisis*, is described by The New York Times as the "clearest guide" to the financial crisis.

Dr. Zandi earned his BS from the Wharton School at the University of Pennsylvania and his PhD at the University of Pennsylvania. He lives with his wife and three children in the suburbs of Philadelphia.

Dante DeAntonio is a senior economist with Moody's Analytics. Dante specializes in the U.S. labor market and regional economics. He conducts labor market research on various topics in partnership with ADP Research Institute. Before joining Moody's Analytics, he worked as an economist in the Current Employment Statistics program at the Bureau of Labor Statistics. Dante is also an adjunct professor in the Economics and Finance Department at West Chester University of Pennsylvania. Previously, he was an adjunct in the Economics Department at Lehigh University. He holds a master's degree and PhD in economics from Lehigh University and a bachelor's degree in economics from Pennsylvania State University.

Matt Colyar is an associate economist at Moody's Analytics in West Chester PA. He covers the economies of Indiana, Delaware, Israel, and several U.S. metro areas. Prior to joining Moody's Analytics, Matt worked at the World Bank, focusing on private sector development in South Asian countries, and in private industry as a financial analyst. He received his master's degree in applied economics from Lehigh University and his bachelor's degree in business administration from West Chester University.

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