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Moody's Analytics U.S. Subnational Model Design

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Introduction

Each month, Moody's Analytics produces forecasts with a 30-year horizon and quarterly periodicity for all U.S. states and metro areas. At the state level, approximately 230 economic and demographic series are forecast; at the metro-area level, about 130 series are forecast. A complete list of all forecast variables is in Appendixes A and B. Moody's Analytics uses its own data estimates in addition to native series released by public and private sources in its models.

Moody's Analytics U.S. Subnational Model Design

BY ADAM KAMINS AND LAURA RATZ

Each month, Moody's Analytics produces forecasts with a 30-year horizon and quarterly periodicity for all U.S. states and metro areas. At the state level, approximately 230 economic and demographic series are forecast; at the metro-area level, about 130 series are forecast. A complete list of all forecast variables is in Appendixes A and B. Moody's Analytics uses its own data estimates in addition to native series released by public and private sources in its models.[1]

Forecasts of the economic and demographic variables are produced via simultaneous econometric equation models using Eviews software. In designing the modeling system, the following four properties were considered paramount: 1) The models must have strong economic theoretical underpinnings; 2) the state model must be directly linked to the U.S. national forecasting model to ensure that state forecasts track the U.S. forecasts closely when summed; 3) the models must produce stable, long-run forecasts that are easy to update each month; and 4) the models must be able to accurately accommodate policy shocks as well as full-fledged alternative macroeconomic scenarios such as the Comprehensive Capital Analysis and Review.

Forecasting process

As with all other Moody's Analytics forecast models, the state and metro area models are updated each month. The forecast is produced using a top-down process; the U.S. macroeconomic model is the first to be updated and run each month. The state forecasts are next, followed by the metro area forecasts. The monthly update of the models involves three broad steps: 1) Historical data are pulled into the models in their entirety to incorporate new datapoints that have been released since the last update, as well as any revisions; 2) any changes to the exogenous variables are updated;[2] and 3) any adjustment factors from economists monitoring the forecasts are evaluated and incorporated.

The U.S. forecast is typically updated on the Monday after the national employment report is released each month. Within two days, the state-level forecast model is run, producing a preliminary forecast that is checked and vetted by both the regional forecasting team and individual state economists. State economists have two days to look at these model-produced forecasts and make adjustments if they see fit.

Adjustments are typically rare and are made for two main reasons. First, there are events that are exogenous to a region's economy and therefore cannot be modeled or forecast. For example, natural or man-made disasters; large-scale military base realignments; large changes in state fiscal policy, including government layoffs or hiring; and large company openings or shutdowns are events that state analysts may have knowledge of but that cannot be forecast in an econometric model. Second, since the models are top-down in structure, the state models are heavily driven by the national forecast. It may be the case that the national forecast trajectory is inappropriate for a particular state's forecast. For example, the national forecast assumes a fast and robust pickup in housing construction. In some states where markets are still oversupplied or where significant constraints to building exist such as labor or material shortages, it may be unrealistic to expect such a rapid rebound in homebuilding, and so a state analyst may adjust the forecast as a result.

These economist-added factors are pulled back into the model, which is re-solved to produce a new baseline forecast. The forecast is then rechecked before it is finalized and made available to external data users.

Once the state forecasts are completed, the metro area forecasts are begun through the same process. From start to finish, the state and metro area forecast update process takes about nine business days.

State model design

The state model system is designed to reflect each state's comparative economic ad-

1 Moody's Analytics has a robust documentation process for all historical data. Detailed information about how the source collects data for each time series and how Moody's Analytics performs any data estimation can be viewed using the Mnemonic 411 feature on www.databuffet.com. Each series posted on Data Buffet has a Mnemonic 411 web page.

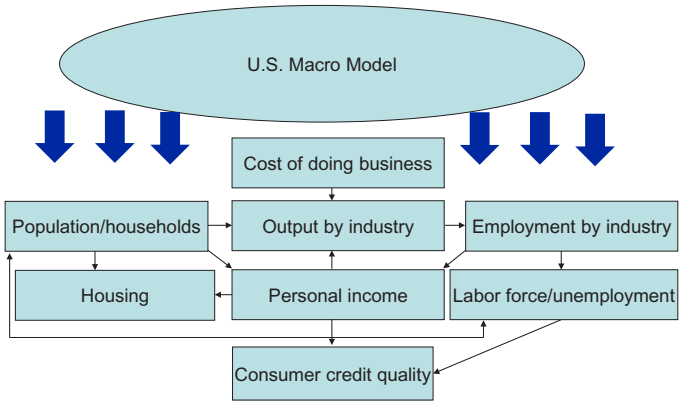
2 All U.S. series are exogenous to the state model, since they are determined in the U.S. macro model.

vantage, to fully model the unique economic structure of each state, and to account for the effects of macroeconomic assumptions on the individual state economies. This is akin to a shift-share approach, whereby the forecast for a state-level economic variable is determined by the forecast of this variable at the national level as well as local-level factors. Comparative advantages are estimated through relative business costs and demographic characteristics. State industrial structure is captured through detailed specifications of output and employment by industry.

All of the equations for the 50 states and the District of Columbia (and, depending on data availability, sometimes Puerto Rico, Guam, and the Virgin Islands) are included in one model. The equations are generally estimated using panel regression techniques, sometimes with common coefficients, sometimes with varying coefficients, depending on the series. This helps with the maintenance and update of the model. Instead of estimating 130 separate equations for each of the 50 states (which would amount to 6,500 equations), only 250 (the state panels, plus Puerto Rico, Guam, and the Virgin Islands usually have their own equation for each stochastic variable) equations have to be estimated and updated. Also, the panel structure provides consistency across the regional forecasts and, in most cases, better equation results. This maximizes the number of observations and degrees of freedom to work with when estimating relationships between the states and the U.S. It is often difficult to find an equation specification that produces reasonable forecasts for small states where the data tend to be more volatile than in larger states. Pooling the data allows for easier estimation, ensures that the sum-of-states aggregate tracks the U.S. forecast well, and guards against forecast outliers that would be much more prevalent without the panel regression structure.

There is no mechanism to force the sum of state-level forecasts to equal the U.S. forecasts that come from the U.S. macro model. Such a constraint would add a layer of complexity to the forecast process that could potentially produce counterintuitive results. Further, the sum-of-state totals for most historical economic data series do not add up to national estimates, which are often gathered from different samples or using different methods. Sum-of-state totals for top-line forecast variables such as GDP, employment, the unemployment rate, population, households, and housing permits, however, are routinely checked during the monthly forecasting process to ensure that differences with the U.S. forecasts remain within a reasonable range.

Chart 1: State Model Linkages



As with the U.S. macro model, the state and metro area models are large-scale structural models of the economy and are fundamentally output based. To the greatest degree possible, the state and metro models are designed to closely approximate the structure of the U.S. modeling system. Of course, at the national level there are many more economic time series available at a high frequency. The smaller the level of geography, the fewer the time series that are available and the lower the frequency at which they are updated.

The state model system is an output-based industry model that is simultaneously solved with a demographic model. The model is solved for forecast periods using the Gauss-Seidel algorithm.

The model is structured so that output influences employment and unemployment; employment influences wages and labor force participation; wages flow back into output; unemployment influences the effective wage rate, which in turn influences income. Income flows into consumer credit variables, retail sales, and housing variables (see Chart 1). Key factors that determine relative state performance within this construct are industrial mix, labor costs, energy costs, tax rates, and the age structure of the population.

The major benefits of the output-based structure of the model are that: 1) It is consistent with economic theory; 2) it is consistent with the structure of the gross product originating and industry employment block of the U.S. macro model; and 3) it allows for the inclusion of cost of doing business indexes to capture relative cost advantages between states.

Output and employment

Moody's Analytics uses historical state gross domestic product data available from the Bureau of Economic Analysis.

At the state level, the GDP block is akin to the U.S. macro model in that there is an equation for total private sector GDP, one for each of the three levels of government (federal, state and local), and intermediate equations for GDP by industry for 21 separate private sector industrial groupings, mostly aligning to the NAICS super sectors, with more granular detail for manufacturing.[3]

The ratio of the intermediate industry forecast to the sum of the intermediate industry forecasts is then applied to the total private sector GDP forecast to determine final GDP by industry.

This structure has two advantages: First, if needed, total GDP can be adjusted without making changes to industry-level GDP in order to affect total output. Second, it aligns state total GDP directly with total national-level GDP. Previously, state total GDP was an identity that was the sum of industry GDPs, which were driven primarily by U.S. industry

3 The 24 industries for which Moody's Analytics estimates separate intermediate GDP equations at the state level are included in the appendixes.

Table 1: Real Private Sector GDP (States)

Dependent variable: dlog(Real private sector GDP_state/Real private sector GDP_U.S.)
R2=0.31
Durbin-Watson=2.07
Data period: 2000Q1-2015Q2

	Coefficient	T-Statistic
constant*	-0.16	-6.58
dlog(Population_state/Population_U.S.)	0.74	7.17
log(Per capita real private sector GDP(t-1)_state-log(Per capita real private sector GDP(t-1)_U.S.)	-0.02	-6.55
dlog(Personal income_state/Personal income_U.S.)	0.68	33.59

Notes:
*Equation estimated with fixed effects so constant terms vary across states.
1. log denotes a natural logarithm
2. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

GDP. Since total U.S. GDP does not always equal the sum of the U.S. GDP by industry series, the previous structure could not eliminate discrepancies between the state- and U.S.-level total GDP forecasts. The total private sector GDP equation ensures that no matter what volatility may exist at the industry level, total sum-of-states GDP will always be tethered to total U.S. GDP.

The total private sector GDP equation is shown in Table 1. State private sector GDP is determined by U.S. private sector GDP, population in the state relative to the U.S., a convergence term that forces state GDP per capita to eventually converge toward U.S. per capita GDP,[4] as well as total personal income in the state relative to the U.S. With the exception of the convergence term, which is specified in natural log terms, the equation is specified in dlog form, or the difference of the natural logs of each series. The dlog form is chosen to deal with the nonstationarity of the population and income-based variables. The equation is estimated using generalized least squares, or GLS, with cross-section weights and fixed effects for the states.

Output by industry is estimated separately for 21 private sector industries as well as federal, state and local government. The private sector equations are intermediate equations that produce a forecast used to ultimately derive a share of total private GDP that then gets applied to total private GDP estimated in the equation above. The industries are divided into export-oriented and local population demand-driven industries. The export-oriented industries are those that produce goods or services for export outside of the state or metro area, in many cases outside of the country. Manufacturing industries are the most obvious example.

For export-oriented goods-producing and service-providing industries, the Moody's Analytics cost of doing business index was included as an explanatory variable, usually with a lag of one to four quarters, since it takes time for cost considerations to influence the location and expansion decisions of export-oriented industries. At the state level, there are three components to the cost of doing business index: state and local taxes, energy costs, and unit labor costs. The state model forecasts the three components in the following ways.

First, for state and local taxes, the last historical index value is simply carried forward over the forecast horizon, essentially making this series exogenous to the model. This is done because Moody's Analytics cannot accurately forecast fiscal policy for all 50 states, so it is assumed that the relative rankings of state tax burdens stay the same throughout the forecast. This also allows for a good policy lever in alternative scenarios where varying levels of taxation are assumed. The state energy cost index is forecast by first creating projections of state-level commercial and industrial electricity prices. Equations are estimated to determine the relationship between state and U.S. commercial and industrial electricity prices. For commercial electricity prices, lagged office-using employment at the state level is also a driver. For industrial prices, industrial output is another driver. For each state, prices are weighted using the U.S. commercial and industrial shares of electricity usage and then are indexed to the sum-of-states prices. Third, unit labor costs are forecast using wages per worker at the state level indexed to wages per worker across the sum of the states. In this way, output influences employment and wages, which indirectly flow back into output via the cost of doing business.

The three components of the cost of doing business index are then weighted for each state using the shares that were used to calculate the historical index.[5]

In addition to the cost of doing business index, U.S. industry GDP, population, and a GDP per capita convergence term

4 The inclusion of a convergence term ensures a closer relationship between sum-of-state GDP and U.S. GDP over the forecast horizon and is also consistent with research suggesting that state economies have converged over time. See "*Together as One? Thoughts on Regional Convergence*," presented at Moody's Analytics Economic Outlook Conference, May 2014, Steven G. Cochrane and Adam Kamins.

5 "U.S. Cost of Doing Business: 2015 Update," *Regional Financial Review* (May 2017).

Table 2: Intermediate Real Machinery Manufacturing GDP (States)

Dependent variable: dlog(Intermediate real machinery manufacturing GDP_state/Real machinery manufacturing GDP_U.S.)
R2=0.04
Durbin-Watson=0.75
Data period: 1977Q2-2014Q4

	Coefficient	T-Statistic
constant*	-0.12	-10.51
dlog(Population_state/Population_U.S.)	0.88	3.35
log(Per capita real machinery manufacturing GDP(t-1)_state-log(Per capita real machinery manufacturing GDP(t-1)_U.S.)	-0.02	-10.89
dlog(Cost of doing business index_state)	-0.44	-4.50

Notes:
*Equation estimated with fixed effects so constant terms vary across states.
1. log denotes a natural logarithm
2. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

Table 3: Intermediate Real Financial Activities GDP (States)

Dependent variable: dlog(Intermediate real financial activities GDP_state/Real financial activities GDP_U.S.)
R2=0.1
Durbin-Watson=2.08
Data period: 1990Q1-2015Q1

	Coefficient	T-Statistic
constant*	-0.28	-11.72
log(Per capita real financial activities GDP(t-1)_state-log(Per capita real financial activities GDP(t-1)_U.S.)	-0.04	-11.83
dlog(Cost of doing business index_state)	-0.11	-1.76
dlog(Personal disposable income_state/Personal disposable income_U.S.)	0.53	16.07
dlog(Population_state/Population_U.S.)	1.18	6.83
Rental vacancy rate_state/Rental vacancy rate_U.S.	-0.00	-2.80

Notes:
*Equation estimated with fixed effects so constant terms vary across states.
1. log denotes a natural logarithm
2. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

are included in the GDP equations for most export-oriented industries. In some cases, other local-level drivers are also included, including per capita income. Tables 2 and 3 show the manufacturing industry equation and the financial activities equation, respectively.

For locally oriented industries that generally do not export their products outside of the state, the cost of doing business term was not included. Instead, disposable income was included to capture the impact of rising economic well-being on demand for local services such as dining out and retail (see Table 4).

Total private GDP and industry GDP are reported by the BEA in inflation-adjusted, or real, terms, and the equations use these series as well. Total nominal GDP is derived from real GDP by applying the national GDP implicit price deflator. This is the same deflator the BEA uses to compute real state GDP historically.

Once output is determined, nonfarm payroll employment by industry is forecast as a function of U.S. employment by industry and the ratio of state to national GDP by industry. Where possible, state-specific coefficients were used in combination with common coefficients to impart more variability across states. For example, total private employment uses state-specific coefficients to capture the impact of the total U.S. private employment for each state. This method is employed for other series as well, so long as coefficients contain the correct sign and are statistically significant in the majority of states, their magnitude is reasonable, and the resulting

Table 4: Intermediate Real Retail Trade GDP (States)

Dependent variable: dlog(Intermediate real retail trade GDP_state/Real retail trade GDP_U.S.)
R2=0.16
Durbin-Watson=1.29
Data period: 1977Q2-2015Q2

	Coefficient	T-Statistic
constant*	-0.12	-12.10
log(Per capita real retail trade GDP(t-1)_state-log(Per capita real retail trade GDP(t-1)_U.S.)	-0.02	-12.06
dlog(Personal disposable income_state/Personal disposable income_U.S.)	0.20	17.83
dlog(Population_state/Population_U.S.)	1.65	23.60

Notes:
*Equation estimated with fixed effects so constant terms vary across states.
1. log denotes a natural logarithm
2. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

forecasts are sensible. As with GDP, the 20 private sector industry employment series are forecast as intermediate values whose ratios to the sum of industry employment get applied to total private employment to produce final forecast values by industry.[6] Federal, state and local government employment is estimated separately. Tables 5 and 6 show the equations for total private employment and an example of an industry employment equation.

During months when employment data are available for two of the three months of the first quarter of the forecast, employment is set equal to the second month of the quarter's value. This is done to incorporate these high-frequency data as soon as possible; analysis by Moody's Analytics has shown that the second month's value is a reliable estimate of that quarter's average employment level. Forecasters still have the ability to make an add-factor adjustment to industry employment if they believe that the second month of the quarter estimate is not representative of employment during the entire quarter.

This same second-month lineup is done with the household survey labor market variables, as well as with industrial production.

Unemployment rate

Unemployment is determined by state GDP relative to U.S. GDP (see Table 7). Okun's law[7] specifies the output gap (the difference between actual GDP growth and potential GDP growth) in relationship to changes in the unemployment rate. This unemployment rate equation flips the relationship around and determines the change in a state's unemployment rate as a function of the change in the national unemployment rate as well as the difference between state and U.S. GDP.

State labor force is determined by the prime working-age population, defined in the model as 25- to 54-year-olds. Relative job growth is also a driver, as is the national labor force (see Table 8). Household employment, unemployment, and the labor force participation rate are identities.

Income

At the state level, Moody's Analytics forecasts total personal income and its components. The historical data are available from the BEA with a quarterly periodicity, and are released on a quarterly basis. There are equations for wages and salaries and several nonwage income components, including contributions to wages and salaries, dividends, interest and rents, farm and nonfarm proprietors' income, supplements to wages and salaries, transfer receipts, and residents' adjustment.

Wages and salaries are the largest component of personal income, typically making up about 50% of the total. In the state forecast model, wage and salary income is an identity—it is the product of total nonfarm payroll employment and the effective wage rate. The effective wage rate historically is calculated as total wages and salaries divided by total employment. In the forecast equation, it is driven by the U.S. effective wage rate, the ratio of state productivity to U.S. productivity, and the difference between the state's unemployment rate and the U.S. unemployment rate.

Most of the nonwage income components are modeled as a function of the U.S. nonwage series and the state's share of national wages and salaries.

Derivations of personal income such as median household income, average household income, per capita income, and personal disposable income are also forecast, many as identities.

Personal disposable income is a CCAR variable at the national level and is heavily used by banking clients of Moody's Analytics for their own scenario creation. To forecast disposable income, the state model includes a forecast for the effective tax rate, which is calculated historically as:

1 – (Disposable income/Total income)

6 Though 21 industries are forecast for GDP, only 20 industries are for employment because agriculture is part of total GDP, and therefore forecast separately, whereas it is not included in nonfarm employment.

7 Okun, Arthur M., "Potential GNP, its measurement and significance," Cowles Foundation, Yale University (1962).

Table 5: Private Nonfarm Employment (States)

Dependent variable: dlog(Private nonfarm employment_state)
R2=0.57
Durbin-Watson=1.42
Data period: 1977Q2-2015Q3

	Coefficient	T-Statistic
dlog(Real private sector GDP_state/Real private sector GDP_U.S.)	0.18	33.38
AK--dlog(Private nonfarm employment_U.S.)	0.51	8.73
AL--dlog(Private nonfarm employment_U.S.)	0.98	16.88
AR--dlog(Private nonfarm employment_U.S.)	0.93	16.04
AZ--dlog(Private nonfarm employment_U.S.)	1.55	26.68
CA--dlog(Private nonfarm employment_U.S.)	1.04	17.98
CO--dlog(Private nonfarm employment_U.S.)	1.16	20.01
CT--dlog(Private nonfarm employment_U.S.)	0.73	12.64
DC--dlog(Private nonfarm employment_U.S.)	0.68	11.77
DE--dlog(Private nonfarm employment_U.S.)	1.05	18.06
FL--dlog(Private nonfarm employment_U.S.)	1.31	22.52
GA--dlog(Private nonfarm employment_U.S.)	1.18	20.39
HI--dlog(Private nonfarm employment_U.S.)	0.78	13.41
IA--dlog(Private nonfarm employment_U.S.)	0.81	13.89
ID--dlog(Private nonfarm employment_U.S.)	1.20	20.74
IL--dlog(Private nonfarm employment_U.S.)	0.80	13.81
IN--dlog(Private nonfarm employment_U.S.)	1.00	17.20
KS--dlog(Private nonfarm employment_U.S.)	0.93	15.98
KY--dlog(Private nonfarm employment_U.S.)	1.05	18.05
LA--dlog(Private nonfarm employment_U.S.)	0.76	13.00
MA--dlog(Private nonfarm employment_U.S.)	0.83	14.31
MD--dlog(Private nonfarm employment_U.S.)	0.95	16.40
ME--dlog(Private nonfarm employment_U.S.)	0.91	15.72
MI--dlog(Private nonfarm employment_U.S.)	1.04	17.92
MN--dlog(Private nonfarm employment_U.S.)	0.96	16.45
MO--dlog(Private nonfarm employment_U.S.)	0.89	15.27
MS--dlog(Private nonfarm employment_U.S.)	0.97	16.66
MT--dlog(Private nonfarm employment_U.S.)	0.87	15.01
NC--dlog(Private nonfarm employment_U.S.)	1.10	18.94
ND--dlog(Private nonfarm employment_U.S.)	0.75	12.96
NE--dlog(Private nonfarm employment_U.S.)	0.80	13.80
NH--dlog(Private nonfarm employment_U.S.)	1.11	19.14
NJ--dlog(Private nonfarm employment_U.S.)	0.80	13.72
NM--dlog(Private nonfarm employment_U.S.)	1.04	17.93
NV--dlog(Private nonfarm employment_U.S.)	1.76	30.18
NY--dlog(Private nonfarm employment_U.S.)	0.75	12.93
OH--dlog(Private nonfarm employment_U.S.)	0.94	16.15
OK--dlog(Private nonfarm employment_U.S.)	0.86	14.78
OR--dlog(Private nonfarm employment_U.S.)	1.22	20.95
PA--dlog(Private nonfarm employment_U.S.)	0.74	12.71
RI--dlog(Private nonfarm employment_U.S.)	0.83	14.30
SC--dlog(Private nonfarm employment_U.S.)	1.11	19.04
SD--dlog(Private nonfarm employment_U.S.)	0.90	15.58
TN--dlog(Private nonfarm employment_U.S.)	1.10	18.91
TX--dlog(Private nonfarm employment_U.S.)	1.05	18.01
UT--dlog(Private nonfarm employment_U.S.)	1.27	21.94
VA--dlog(Private nonfarm employment_U.S.)	1.02	17.55
VT--dlog(Private nonfarm employment_U.S.)	0.93	16.08
WA--dlog(Private nonfarm employment_U.S.)	1.18	20.33
WI--dlog(Private nonfarm employment_U.S.)	0.96	16.50
WV--dlog(Private nonfarm employment_U.S.)	0.84	14.44
WY--dlog(Private nonfarm employment_U.S.)	0.95	16.37

Notes:
1. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

Table 6: Construction Employment (States)

Dependent variable: dlog(Construction employment_state/Construction employment_U.S.)
R2=0.33
Durbin-Watson=1.84
Data period: 1977Q2-2015Q3

	Coefficient	T-statistic
AK--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.49081	20.41888
AL--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.334166	3.609348
AR--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.515814	7.641112
AZ--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.717789	12.99039
CA--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.539478	5.567793
CO--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.726431	11.03137
CT--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.5556	6.787215
DC--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.391088	7.783055
DE--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.276685	5.233533
FL--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.650255	7.335843
GA--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.509383	4.967663
HI--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.459027	9.289054
IA--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.583827	8.770398
ID--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.370063	7.454382
IL--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.378643	3.641165
IN--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.527335	5.37835
KS--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.596035	7.163136
KY--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.572194	6.464677
LA--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.499131	10.43557
MA--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.563556	7.191684
MD--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.502884	4.128883
ME--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.560396	9.1113
MI--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.558621	7.195395
MN--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.557166	5.155912
MO--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.372456	3.95454
MS--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.413846	8.308172
MT--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.712756	13.00948
NC--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.415124	2.984906
ND--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.565989	17.09982
NE--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.513903	7.853892
NH--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.498037	10.09255
NJ--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.424932	4.380488
NM--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.45267	7.117556
NV--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.736504	15.65675
NY--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.568584	5.972202
OH--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.405463	3.392231
OK--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.604659	10.66838
OR--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.673624	10.74175
PA--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.480671	3.846226
RI--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.5782	7.060816
SC--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.60698	5.207853
SD--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.447305	8.023786
TN--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.275933	2.892134
TX--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.581255	7.701854
UT--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.670513	12.07079
VA--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.338015	2.997427
VT--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.51675	8.663751
WA--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.567374	7.686045
WI--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.506534	5.405639
WV--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.452882	8.699619
WY--dlog(Real construction GDP_state/Real construction GDP_U.S.)	0.479535	15.33171

Notes:
1. dlog denotes a difference of a natural logarithm

Source: Moody's Analytics

Table 7: Unemployment Rate (States)

Dependent variable: d(Unemployment rate_state)
R2=0.66
Durbin-Watson=1.7
Data period: 2000Q1-2013Q4

	Coefficient	T-Statistic
dlog(Real GDP_state/Real GDP_U.S.)	-2.50	-6.76
AK--d(Unemployment rate_U.S.)	0.44	5.19
AL--d(Unemployment rate_U.S.)	1.20	14.17
AR--d(Unemployment rate_U.S.)	0.55	6.47
AZ--d(Unemployment rate_U.S.)	0.97	11.43
CA--d(Unemployment rate_U.S.)	1.10	12.93
CO--d(Unemployment rate_U.S.)	1.01	11.89
CT--d(Unemployment rate_U.S.)	0.68	8.02
DC--d(Unemployment rate_U.S.)	0.80	9.42
DE--d(Unemployment rate_U.S.)	0.79	9.25
FL--d(Unemployment rate_U.S.)	1.18	13.89
GA--d(Unemployment rate_U.S.)	0.91	10.68
HI--d(Unemployment rate_U.S.)	0.74	8.70
IA--d(Unemployment rate_U.S.)	0.61	7.21
ID--d(Unemployment rate_U.S.)	0.69	8.14
IL--d(Unemployment rate_U.S.)	0.97	11.39
IN--d(Unemployment rate_U.S.)	1.19	13.95
KS--d(Unemployment rate_U.S.)	0.74	8.66
KY--d(Unemployment rate_U.S.)	0.94	11.09
LA--d(Unemployment rate_U.S.)	0.76	8.94
MA--d(Unemployment rate_U.S.)	0.77	9.02
MD--d(Unemployment rate_U.S.)	0.77	9.07
ME--d(Unemployment rate_U.S.)	0.69	8.14
MI--d(Unemployment rate_U.S.)	1.33	15.61
MN--d(Unemployment rate_U.S.)	0.76	8.96
MO--d(Unemployment rate_U.S.)	0.96	11.26
MS--d(Unemployment rate_U.S.)	0.82	9.60
MT--d(Unemployment rate_U.S.)	0.36	4.28
NC--d(Unemployment rate_U.S.)	1.16	13.67
ND--d(Unemployment rate_U.S.)	0.31	3.63
NE--d(Unemployment rate_U.S.)	0.42	4.98
NH--d(Unemployment rate_U.S.)	0.61	7.23
NJ--d(Unemployment rate_U.S.)	0.94	11.02
NM--d(Unemployment rate_U.S.)	0.60	7.00
NV--d(Unemployment rate_U.S.)	1.15	13.49
NY--d(Unemployment rate_U.S.)	0.82	9.65
OH--d(Unemployment rate_U.S.)	0.96	11.35
OK--d(Unemployment rate_U.S.)	0.79	9.28
OR--d(Unemployment rate_U.S.)	1.29	15.13
PA--d(Unemployment rate_U.S.)	0.68	8.03
RI--d(Unemployment rate_U.S.)	0.79	9.31
SC--d(Unemployment rate_U.S.)	1.22	14.41
SD--d(Unemployment rate_U.S.)	0.57	6.71
TN--d(Unemployment rate_U.S.)	1.05	12.32
TX--d(Unemployment rate_U.S.)	0.74	8.70
UT--d(Unemployment rate_U.S.)	1.18	13.89
VA--d(Unemployment rate_U.S.)	0.84	9.84
VT--d(Unemployment rate_U.S.)	0.65	7.65
WA--d(Unemployment rate_U.S.)	1.07	12.63
WI--d(Unemployment rate_U.S.)	0.99	11.63
WV--d(Unemployment rate_U.S.)	0.83	9.72
WY--d(Unemployment rate_U.S.)	0.73	8.62

Notes:
1. d denotes simple difference
2. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

Table 8: Labor Force (States)

Dependent variable: dlog(Labor force_state/Labor force_U.S.)
R2=0.19
Durbin-Watson=1.44
Data period: 1980Q2-2013Q2

	Coefficient	T-Statistic
dlog(Population 25 to 54_state/Population 25 to 54_U.S.)	0.60	29.33
dlog(Total nonfarm employment_state/Total nonfarm employment_U.S.)	0.14	13.00

Notes:
1. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

Table 9: Effective Tax Rate (States)

Dependent variable: dlog(Effective tax rate_state)
R2=0.55
Durbin-Watson=2.36
Data period: 1980Q2-2013Q4

	Coefficient	T-Statistic
dlog((Total personal income_U.S.-Personal disposable income_U.S.)/Total personal income_U.S.)	0.97	92.22

Notes:
1. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

The forecast for the state effective tax rate is driven off the U.S. effective tax rate. This tax rate is then applied to total income to produce disposable income (see Table 9).

Disposable income flows back into GDP for local demand-driven industries as well as retail sales, household debt service, and consumer credit delinquency rates.

Metro area model design

The Moody's Analytics metro area models are structured in much the same way as the state model. This section will describe the models and point out differences in design between the two.

Metro area forecasts are produced using 51 separate models—one for each state and Puerto Rico. Equations are estimated in panel form, with the metro areas in each state forming the panel members. This structure continues the top-down approach, with each state's forecast driving the forecasts for the metro areas in the state. Just as the U.S. forecast series are the exogenous drivers of the state forecasts, the state forecasts are the exogenous drivers of the metro area forecasts.

Equations are designed to mimic the equation structures of the state models where possible. The process for updating the metro area forecasts each month is identical to the state model process described earlier: 1) New historical data are updated each month; 2) new exogenous data, in this case the state forecasts, are read in and the model is solved; and 3) economists check their forecasts and make adjustments if necessary, and the model is resolved.

Output and employment

Unlike at the state level, where industry output is forecast and squeezed to total output, at the metro area level, only total GDP is forecast. The GDP equation for metro areas is similar in structure to the equation for states: Output is determined by state-level GDP, relative population growth, relative income growth, and a GDP per capita convergence term. The equation is estimated with cross-section fixed effects (see Table 10).

Once GDP is determined, the model solves for total private sector employment, which is determined by GDP growth in the metro area relative to the state, as well as state-level private employment (see Table 11).

Just as in the state models, industry employment is forecast for 20 nonfarm industries. These forecasts are intermediate values whose shares of total industry employment are applied to total private sector employment to get final values for industry employment. Since Moody's Analytics does not forecast GDP by industry at the metro level, industry employment equations use state-level industry employment as the independent variables in the equations. Where possible, these equations are specified using cross-section varying coefficients

Table 10: Real GDP (Pennsylvania Metro Areas)

Dependent variable: dlog(Real GDP_metro/Real GDP_PA)
R2=0.07
Durbin-Watson=1.83
Data period: 1980Q2-2015Q2

	Coefficient	T-Statistic
constant*	-0.0007	-2.97
dlog(Population_metro/Population_PA)	1.04	8.07
log(Per capita real GDP(t-1)_metro-log(Per capita real GDP(t-1)_PA)	-0.01	-2.81
dlog(Personal income_metro/Personal income_PA)	0.09	3.84

Notes:
*Equation estimated with fixed effects so constant terms vary across metro areas.
1. log denotes a natural logarithm.
2. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

Table 11: Private Nonfarm Employment (Pennsylvania Metro Areas)

Dependent variable: dlog(Private nonfarm employment_metro/Private nonfarm employment_PA)
R2=0.54
Durbin-Watson=1.73
Data period: 1980Q2-2015Q4

	Coefficient	T-Statistic
Allentown--dlog(Real GDP_metro/Real GDP_PA)	0.35	8.04
Altoona--dlog(Real GDP_metro/Real GDP_PA)	0.64	13.28
Bloomsburg--dlog(Real GDP_metro/Real GDP_PA)	0.62	14.84
Chambersburg--dlog(Real GDP_metro/Real GDP_PA)	0.75	15.28
East Stroudsburg--dlog(Real GDP_metro/Real GDP_PA)	0.62	12.68
Erie--dlog(Real GDP_metro/Real GDP_PA)	0.55	12.53
Gettysburg--dlog(Real GDP_metro/Real GDP_PA)	0.79	19.45
Johnstown--dlog(Real GDP_metro/Real GDP_PA)	0.69	15.43
Lancaster--dlog(Real GDP_metro/Real GDP_PA)	0.54	11.77
Lebanon--dlog(Real GDP_metro/Real GDP_PA)	0.65	14.55
Montgomery--dlog(Real GDP_metro/Real GDP_PA)	0.47	10.95
Philadelphia--dlog(Real GDP_metro/Real GDP_PA)	0.53	11.82
Pittsburgh--dlog(Real GDP_metro/Real GDP_PA)	0.33	7.53
Reading--dlog(Real GDP_metro/Real GDP_PA)	0.47	10.54
Scranton--dlog(Real GDP_metro/Real GDP_PA)	0.42	9.47
State College--dlog(Real GDP_metro/Real GDP_PA)	0.69	11.76
Williamsport--dlog(Real GDP_metro/Real GDP_PA)	0.66	17.93
York--dlog(Real GDP_metro/Real GDP_PA)	0.50	11.81
Harrisburg--dlog(Real GDP_metro/Real GDP_PA)	0.51	8.31

Notes:
1. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

Table 12: Retail Trade Employment (Pennsylvania Metro Areas)

Dependent variable: dlog(Retail trade employment_metro)
R2=0.36
Durbin-Watson=2.13
Data period: 1980Q2-2016Q1

	Coefficient	T-Statistic
dlog(Retail sales_metro/Retail sales_PA)	0.67	21.49
Allentown--dlog(Retail trade employment_PA)	0.91	9.18
Altoona--dlog(Retail trade employment_PA)	0.88	4.87
Bloomsburg--dlog(Retail trade employment_PA)	1.16	4.05
Chambersburg--dlog(Retail trade employment_PA)	0.67	3.29
East Stroudsburg--dlog(Retail trade employment_PA)	1.30	6.38
Erie--dlog(Retail trade employment_PA)	0.96	7.27
Gettysburg--dlog(Retail trade employment_PA)	0.85	3.38
Johnstown--dlog(Retail trade employment_PA)	1.20	7.41
Lancaster--dlog(Retail trade employment_PA)	0.74	7.65
Lebanon--dlog(Retail trade employment_PA)	0.76	3.71
Montgomery--dlog(Retail trade employment_PA)	1.23	11.31
Philadelphia--dlog(Retail trade employment_PA)	0.78	7.26
Pittsburgh--dlog(Retail trade employment_PA)	0.89	13.24
Reading--dlog(Retail trade employment_PA)	1.05	7.56
Scranton--dlog(Retail trade employment_PA)	1.02	9.06
State College--dlog(Retail trade employment_PA)	0.87	4.63
Williamsport--dlog(Retail trade employment_PA)	1.05	6.24
York--dlog(Retail trade employment_PA)	1.05	10.07
Harrisburg--dlog(Retail trade employment_PA)	0.97	9.72

Notes:
1. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

rather than common coefficients (see Table 12).

As is done for the states, nonfarm payroll employment as well as the unemployment rate, labor force, household employment, and industrial production are set equal to the second month of the quarter's values when two months of data are available.

Unemployment rate

The unemployment rate forecast equation also mimics that of the state. Unemployment rates for metro areas are forecast using the state's unemployment rate as well as relative GDP growth (see Table 13).

The labor force equation for the metro areas is the same as for the states: A metro area's labor force is determined by state-level labor force, the proportion of the population that is prime working age, and relative employment growth.

Income

Just as in the state forecast, total personal income for metro areas is an identity: It is the sum of wage and salary income and nonwage income. Unlike at the state level, where wages and salaries are an identity and the components of nonwage income are forecast separately, at the metro area level, there are only two forecast equations—one for wages and salaries and one for total nonwage income (see Tables 14 and 15).

The same derivations of income at the state level are forecast at the metro area level: per capita income, median household income, average household income, and disposable income.

Disposable income, a CCAR variable, is an identity at the metro level and is determined by applying the state effective tax rate determined in the state forecast to total metro personal income.

Model assumptions and limitations

Throughout the development of the Moody's Analytics state and metro area macroeconomic models, several methodological assumptions were made. First, the methodology assumes that past behavior is a good predictor of future behavior. Indeed, the notion that the past can be a predictor of the future is the basic premise of all quantitative estimation methods and predictive modeling techniques. A single set of parameters is estimated and used to generate forecasts of the model's endogenous variables. This approach assumes that the relationships observed over the estimation period will hold over the forecast period, but sometimes those relationships deviate. As evidenced by the Great Recession, severe economic disruptions can disable the transmission mechanism for monetary policy, dampen fiscal multipliers, amplify

Table 13: Unemployment Rate (New York Metro Areas)

Dependent variable: d(Unemployment rate_metro)
R2=0.68
Durbin-Watson=1.8
Data period: 1990Q2-2015Q4

	Coefficient	T-Statistic
dlog(Real GDP_metro/Real GDP_NY)	-0.924075	-2.022901
Albany--d(Unemployment rate_NY)	0.655291	13.73885
Binghamton--d(Unemployment rate_NY)	0.826104	15.08836
Buffalo--d(Unemployment rate_NY)	0.81109	12.68226
Dutchess--d(Unemployment rate_NY)	0.793772	9.404365
Elmira--d(Unemployment rate_NY)	0.936753	10.69024
Glen Falls--d(Unemployment rate_NY)	0.820635	8.17176
Ithaca--d(Unemployment rate_NY)	0.455213	7.909858
Kingston--d(Unemployment rate_NY)	0.744731	10.86516
Nassau--d(Unemployment rate_NY)	0.807224	16.27501
New York--d(Unemployment rate_NY)	1.160187	34.70045
Rochester--d(Unemployment rate_NY)	0.70524	13.684
Syracuse--d(Unemployment rate_NY)	0.830629	15.02548
Utica--d(Unemployment rate_NY)	0.714209	12.21185
Watertown--d(Unemployment rate_NY)	0.895736	5.433636

Notes:
1. d denotes a simple difference.
2. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

uncertainty, and undermine confidence. By definition, the models' greatest misses will be during "black swan" events such as the Great Recession.

Second, forecasts based on statistical models are subject to assumptions of future values to model inputs. Even a good model may produce an inaccurate forecast if the future inputs are too divergent from actual events. Conversely, an accurate forecast can be obtained with a bad model and inaccurate future inputs. The model's forecast error is amplified when inaccurate forecasts for driver series are used to generate forecasts for dependent variables.

Third, as in any large-scale structural model, the Moody's Analytics state and metro area models rely on exogenous data to help determine the forecast for their endogenous variables. The models' forecasts are dynamic. This means that forecasts for certain variables are allowed to influence forecasts for other variables in the same period, and the forecasts represent the solution to a system of simultaneous equations. The models are solved in blocks, with the first block including variables that depend on exogenous variables such as population. Forecasts for endogenous variables in the first block are used to forecast other endogenous variables in the models. Therefore, errors in the forecasts for exogenous variables that are major inputs to the state and metro area models such as the population forecasts create errors in forecasts for endogenous variables as well.

Fourth, during equation-building, Moody's Analytics emphasizes economic fundamentals. In certain instances, variables can be included in an equation specification even if they are not statistically significant at the 95% confidence interval. Moreover, small amounts of positive autocorrelation and multicollinearity are permissible, although egregious amounts of either are not. In all equation estimations, fundamentals come first and foremost, and then every attempt is made to minimize standard error and bias and ensure that all regressors are statistically significant.

Model enhancement framework

Moody's Analytics is continuously monitoring its state and metro area models, incorporating internal and external feedback to improve forecast accuracy, and expanding the models' capabilities. Moody's Analytics has a rigorous process for refining its models. Moody's Analytics tracks requests for equation examination, both internal and external, and aims to improve equations systematically, either by changing the estimation range or changing the equation specification.

The first step when respecifying an equation is gauging its in-sample performance. The equation is simulated dynamically over several historical periods. If the fitted values of the in-sample forecast approximate the actual historical values relatively closely, the equation is then used to produce a baseline forecast and is simulated over a standard set of 10 alternative scenarios. In these simulations, the goal is to ensure that the equation's short-term dynamic responses to the shocks are reasonable, and that the forecast series returns to its long-

Table 14: Wage and Salary Income (Florida Metro Areas)

Dependent variable: dlog(Wage and Salary income per employee_metro)
R2=0.22
Durbin-Watson=2.35
Data period: 1980Q2-2014Q4

	Coefficient	T-Statistic
Cape Coral--dlog(Wage and salary income per employee_FL)	0.89	8.73
Crestview--dlog(Wage and salary income per employee_FL)	0.99	9.73
Deltona--dlog(Wage and salary income per employee_FL)	0.96	9.36
Fort Lauderdale--dlog(Wage and salary income per employee_FL)	0.98	9.61
Gainesville--dlog(Wage and salary income per employee_FL)	1.01	9.88
Homosassa Springs--dlog(Wage and salary income per employee_FL)	1.14	11.11
Jacksonville--dlog(Wage and salary income per employee_FL)	1.13	11.09
Lakeland--dlog(Wage and salary income per employee_FL)	0.83	8.08
Miami--dlog(Wage and salary income per employee_FL)	0.88	8.60
Naples--dlog(Wage and salary income per employee_FL)	0.86	8.37
North Port--dlog(Wage and salary income per employee_FL)	1.10	10.75
Ocala--dlog(Wage and salary income per employee_FL)	0.91	8.86
Orlando--dlog(Wage and salary income per employee_FL)	1.04	10.15
Palm Bay--dlog(Wage and salary income per employee_FL)	0.91	8.93
Panama City--dlog(Wage and salary income per employee_FL)	0.96	9.44
Pensacola--dlog(Wage and salary income per employee_FL)	1.03	10.03
Port St. Lucie--dlog(Wage and salary income per employee_FL)	0.90	8.84
Punta Gorda--dlog(Wage and salary income per employee_FL)	0.88	8.61
Sebastian--dlog(Wage and salary income per employee_FL)	0.94	9.22
Sebring--dlog(Wage and salary income per employee_FL)	0.68	6.61
Tallahassee--dlog(Wage and salary income per employee_FL)	1.04	10.15
Tampa--dlog(Wage and salary income per employee_FL)	1.08	10.61
The Villages--dlog(Wage and salary income per employee_FL)	1.07	10.47
West Palm Beach--dlog(Wage and salary income per employee_FL)	1.04	10.16

Notes:
1. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

run growth path. Since the sample period of estimation is often quite short, there is typically no holdout sample used for testing. Moody's Analytics opts to include the most recent historical data available in the estimation period, which precludes conducting strict out-of-sample tests during equation estimation.

Once the specified equation can generate accurate in-sample forecasts and a reasonable baseline forecast, and it responds to shocks with intuitive short-term cyclicality before reverting to the long-run trend, the equation is circulated internally for review. The reviewers include economists with expertise in related fields, econometricians on staff, and the chief economist. Moody's Analytics keeps track of re-estimated equations and new additions to the models. Whenever a new variable is added to the model, the forecast for that variable will typically be accompanied with a blog post on the Data Buffet web site.

Once in the model, an equation's performance is monitored over time. For example, the implied add factors necessary for the equation to reproduce recent history are examined periodically. If they are found to be large relative to the series being modeled and there are no known mitigating circumstances, they are reviewed further.

Forecast quality control procedures

Each month when Moody's Analytics updates its state and metro area models, a number of diagnostics and routine checks are run on both the preliminary and final forecasts.

First, before the state forecasts are run, a forecast comparison graphing program is run on the U.S. exogenous variables that are included in the state model. These forecasts are checked for any errors as well as large changes over the month.

Once the new historical state-level data and the new exogenous data are pulled into the models, and they are solved to produce a new forecast, the state data are checked for consistency. One of the standard diagnostics involves comparing growth rates for population, households, employment, income, real GDP, the unemployment rate, and housing permits in the new forecast with growth rates from the four previous forecast vintages.

Table 15: Nonwage Income (Florida Metro Areas)

Dependent variable: dlog(Nonwage income per capita_metro)
R2=0.69
Durbin-Watson=1.45
Data period: 1980Q2-2013Q2

	Coefficient	T-Statistic
Cape Coral--dlog(Nonwage income per capita_FL)	1.01	21.73
Crestview--dlog(Nonwage income per capita_FL)	0.92	19.84
Deltona--dlog(Nonwage income per capita_FL)	0.89	19.21
Fort Lauderdale--dlog(Nonwage income per capita_FL)	0.83	17.95
Gainesville--dlog(Nonwage income per capita_FL)	1.09	23.55
Homosassa Springs--dlog(Nonwage income per capita_FL)	0.87	18.80
Jacksonville--dlog(Nonwage income per capita_FL)	0.97	20.94
Lakeland--dlog(Nonwage income per capita_FL)	1.11	23.91
Miami--dlog(Nonwage income per capita_FL)	0.93	20.08
Naples--dlog(Nonwage income per capita_FL)	1.31	28.19
North Port--dlog(Nonwage income per capita_FL)	1.09	23.54
Ocala--dlog(Nonwage income per capita_FL)	0.92	19.79
Orlando--dlog(Nonwage income per capita_FL)	0.95	20.45
Palm Bay--dlog(Nonwage income per capita_FL)	0.89	19.26
Panama City--dlog(Nonwage income per capita_FL)	0.87	18.75
Pensacola--dlog(Nonwage income per capita_FL)	0.83	17.92
Port St. Lucie--dlog(Nonwage income per capita_FL)	1.18	25.45
Punta Gorda--dlog(Nonwage income per capita_FL)	0.93	19.98
Sebastian--dlog(Nonwage income per capita_FL)	1.30	27.91
Sebring--dlog(Nonwage income per capita_FL)	1.10	23.62
Tallahassee--dlog(Nonwage income per capita_FL)	1.03	22.14
Tampa--dlog(Nonwage income per capita_FL)	0.94	20.20
The Villages--dlog(Nonwage income per capita_FL)	1.02	21.98
West Palm Beach--dlog(Nonwage income per capita_FL)	1.22	26.19

Notes:
1. dlog denotes a difference of a natural logarithm.

Source: Moody's Analytics

Changes in excess of 10% from the prior month are flagged. These changes are almost always consistent with changes in the national-level forecast, either because assumptions about the outlook changed or because new and revised data caused a shift in the national forecast.

Forecasts that show a substantial change from the prior month's forecast or contain evidence of an unusually sharp single-period increase or decrease are flagged and inspected visually to ensure that the forecast is sensible. If not, potential culprits such as changes in the exogenous variables and historical revisions are examined and adjustments are made by some combination of the relevant regional analyst and an economist responsible for running the regional models.

Sum-of-state aggregates for these same variables plus an additional 40 are checked against the national forecast to be sure that the sum-of-state forecasts are close to the national forecast. This check is more subjective in nature in that there is no statistical threshold of deviation between the two series that will trigger a revision. At times, when the sum of states and the U.S. series have deviated substantially, changes were made to the national-level forecast (and subsequently not allowed to flow down to the states) to bring the two series closer in line with one another. At other times, systematic or targeted changes were made to state forecasts to narrow the gap. The sum-of-states diagnostic also helps to spot the presence of systematic errors in the state forecasts that may come from the model solve or from the exogenous data.

The final layer of quality control on the preliminary state forecasts comes from the individual state economists. Each state and metro area is covered by an economist who follows the area closely. The preliminary forecasts are sent to each analyst to check and to allow them to make adjustments if they deem necessary. A database that contains the pure model solve of the forecasts without add factors is provided to the analysts as another diagnostic tool. Accumulated add factors may no longer be appropriate for a particular series or may be introducing forecast error, so the pure model solve database allows analysts to make a judg-

ment about whether existing add factors are appropriate.

Once economists have checked and add-factored their forecasts (or removed add factors), the add factors are pulled back into the model, and it is re-solved. At this point, the same diagnostics are repeated: forecast consistency and sum-of-states comparisons.

At the metro level, a similar process is performed with the addition of a diagnostic that checks the sum-of-metro-area variables against the state forecasts. This diagnostic checks to make sure that there are not instances where the sum of metro areas in a state exceeds the state forecast. This will happen in several states because metro areas can cross state lines. For instance, the New York-Jersey City-White Plains metro division straddles New York and New Jersey, so variables such as income, employment and GDP for New York metro areas usually exceed the state totals by 5% to 10%. But for most states, metro areas are wholly contained within a state's boundaries and therefore should not exceed state totals.

In addition to the monthly reviews of the forecasts by analysts, each year, the regional forecast team reviews the accuracy of the employment forecasts for states and metro areas and publishes the results in the April edition of the Regional Financial Review.[8] This entire issue is dedicated to reviewing the prior year's accuracy of all of the forecasts produced by Moody's Analytics, including regional, U.S. macro, housing and international.

Unconditional back-testing

An important test conducted on equations is unconditional back-testing. The historical values of real GDP, nominal GDP, real disposable income, nominal disposable income, employment, and the unemployment rate are compared with estimates generated by the model through a partially controlled dynamic back test. To produce this, a single set of parameters, estimated over the entire sample period, was used to generate a set of dynamic forecasts from the first quarter of 2009 to the last quarter of history.[9] Historical data for the right-hand-side variables at the level of geography for which the model is created were available through the fourth quarter of 2008. No qualitative overlays were permitted to influence the forecasts, ensuring that they are a pure model solution. Forecast errors were allowed to compound over the forecast horizon. However, in instances where the state model required U.S. information, U.S. actual history was used.[10] This same framework was employed to conduct the metro area unconditional back tests. In all instances where the metro area models required U.S. or state-level information, the actual history from the state and macro models was used.

A dynamic forecast is more informative than a static one, since it provides a glimpse into the future based solely on the information available. Dynamic forecast errors depend crucially on the forecast starting point. Therefore, forecast errors would have been smaller if the dynamic back test had started in 2011. This is because it is difficult for econometric models to predict recessions, and the U.S. economy did not emerge from recession until June 2009. As has been the case after previous financial crises, the recovery has been much slower than after recessions without financial crises.

Moreover, the equations in the model were estimated over long sample periods, in some cases decades, while macroeconomic variables have fluctuated abnormally over the past five years, magnifying forecast error. For this reason, most econometric models overestimated growth from 2009 to 2016.

The results of three of the unconditional back-test model simulations are presented, starting in the first quarter of 2009, the first quarter of 2011 and the first quarter of 2013 (see Charts 2-11). The forecast error presented refers to the last unconditional back test that could be made two years prior to the end of history for the dependent variable. For instance, the forecast error for sum-of-state real GDP is calculated comparing the variable's actual value in the third quarter of 2016 to its forecast value in the same quarter in the unconditional back test that began in the third quarter of 2013.

Conditional back-testing

For stochastic variables, that is, those estimated directly from econometric models, conditional back-testing is an additional test performed to validate the Moody's Analytics regional models. Among the variables examined, the unemployment rate is the only one modeled as a stochastic at the state level (see Chart 12). Real GDP and unemployment are modeled stochastics in the metro area models. Under conditional back-testing, a controlled dynamic back test is generated using the same set of parameters that are utilized under unconditional back-testing. Rather than letting the model generate forecasts for the regressors of the stochastic variables at the level of geography at which the model is created, all of the regressors were exogenized from the model solution, and their forecasts were replaced with actual historical data during the back-test period. In contrast with the unconditional back test, there is full information about the actual historical values of all the regressors. This includes the "level above" variables as well as endogenous variables that are inputs into the CCAR stochastic variables' forecast equations. As with the other back tests, the results of the conditional back test are compared with actual values and the root mean squared error statistic is recomputed.[11]

For instance, the forecast for the state-level unemployment rates depends on the U.S. unemployment rate, U.S. real GDP,

8 See "Forecast Accuracy: U.S. Regional Economies," *Regional Financial Review* (April 2017).

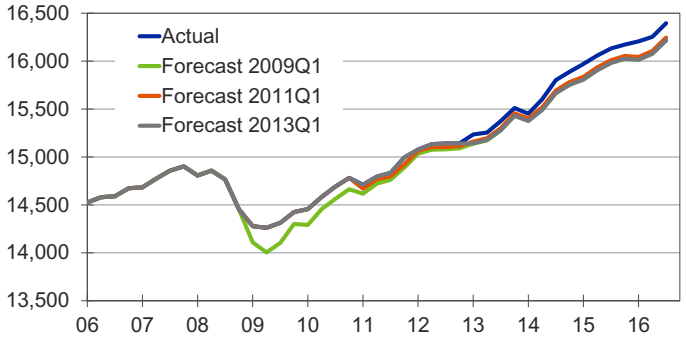
9 Strictly speaking, the dynamic back test is not an out-of-sample forecast, since some of the forecast equations have "seen" the historical data from 2009 to 2016.

10 The U.S. dynamic back test was conducted using the same methodology as the state and metro area dynamic back tests. Add factors were removed from the Moody's Analytics macro model, and forecast errors were allowed to compound through the fourth quarter of 2013. For example, the dynamic back-test result for U.S. real GDP from the Moody's Analytics macroeconomic model was used to produce the dynamic back-test results for state-level real GDP.

11 Nominal GDP is included in this process. As with real and nominal disposable income, it is an identity, but real GDP is a stochastic variable, and nominal GDP is merely inflated real GDP. Thus, the controlled dynamic back-test result for real GDP was used in conjunction with the GDP deflator to produce controlled dynamic back-test forecasts for nominal GDP.

Chart 2: Real GDP, Uncond. Back Test

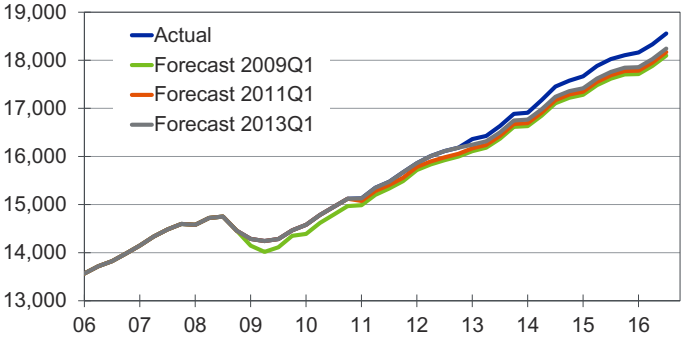
Sum of states, chained 2009$ bil, SAAR



Sources: BEA, Moody's Analytics

Chart 3: Nominal GDP, Uncond. Back Test

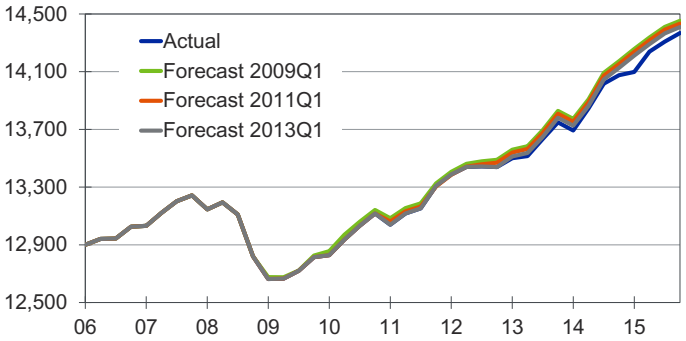
Sum of states, $ bil, SAAR



Sources: BEA, Moody's Analytics

Chart 4: Real GDP, Uncond. Back Test

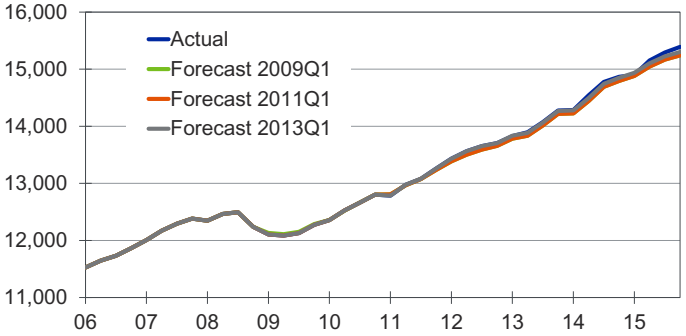
Sum of metro areas, chained 2009$ bil, SAAR



Sources: BEA, Moody's Analytics

Chart 5: Nominal GDP, Uncond. Back Test

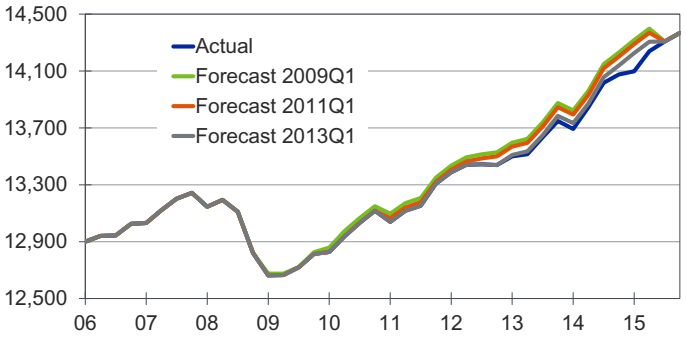
Sum of metro areas, $ bil, SAAR



Sources: BEA, Moody's Analytics

Chart 6: Real GDP, Conditional Back Test

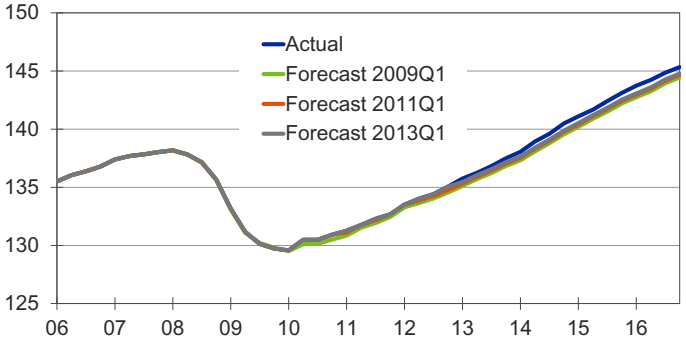
Sum of metro areas, chained 2009$ bil, SAAR



Sources: BEA, Moody's Analytics

Chart 7: Employment, Uncond. BackTest

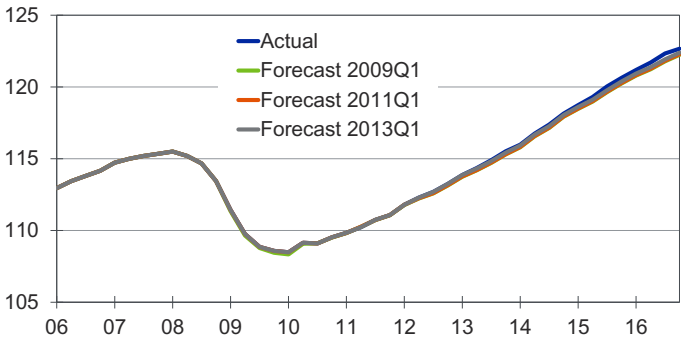
Sum of states, mil, SA



Sources: BLS, Moody's Analytics

Chart 8: Employment, Uncond. Back Test

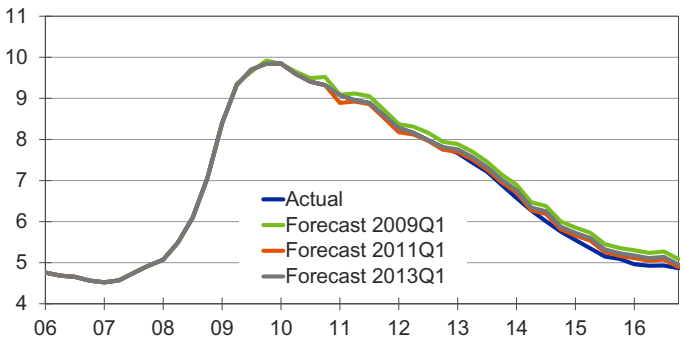
Sum of metro areas, mil, SA



Sources: BLS, Moody's Analytics

Chart 9: Unemp. Rate, Uncond. Back Test

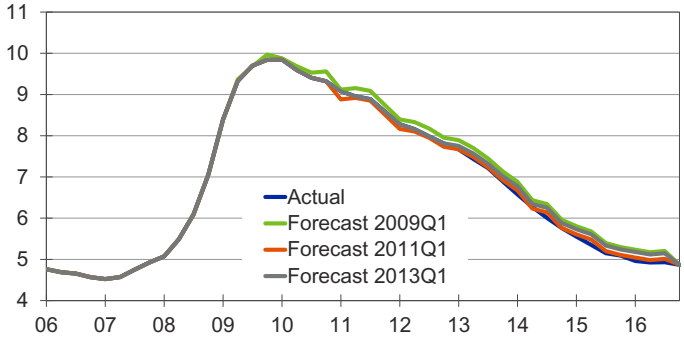
Sum of states, %



Sources: BLS, Moody's Analytics

Chart 10: Unemp. Rate, Cond. Back Test

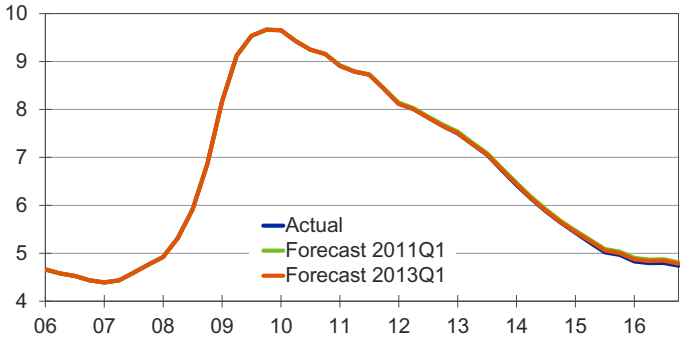
Sum of states, %



Sources: BEA, Moody's Analytics

Chart 11: Unemp. Rate, Uncond. Back Test

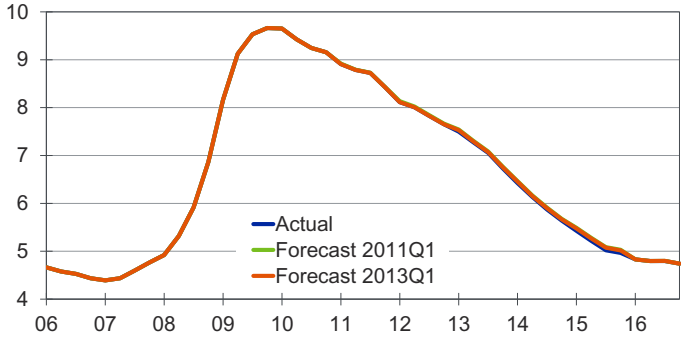
Sum of metro areas, %



Sources: BEA, Moody's Analytics

Chart 12: Unemp. Rate, Cond. Back Test

Sum of metro areas, %



Sources: BEA, Moody's Analytics

and state-specific real GDP. First, Moody's computes the unconditional back test for the state-level unemployment rates by exogenizing U.S. real GDP and the U.S. unemployment rate, setting their values equal to history and resolving the model. The root mean squared error statistic is computed by comparing the results with the actual historical values. Second, the conditional back test for state-level unemployment rates is computed by exogenizing state-specific GDP as well, setting its value equal to history and resolving the model. The root mean squared error statistic is recomputed.

Two types of variables

Real and nominal disposable income, real and nominal GDP, and payroll employment are forecast as identities in the state model. Real and nominal disposable income, nominal GDP, and payroll employment are forecast as identities in the metro area model. In an identity, the forecast for a variable is set equal to an arithmetical relationship rather than the fitted value of an econometric equation. For example, nominal disposable income is the sum of all sources of income less the taxes that are paid on that income, and real disposable income is nominal income deflated using the U.S. personal consumption expenditure deflator. Real GDP at the state level is the sum of government and private sector GDP, and employment is the sum of employment in each industry. By definition, the values for these series cannot deviate from the specified identities. Thus, there is no specification error inherent in an identity. There is no equation for which to conduct conditional back-testing.

Stochastic variables are subject to specification error, however, since their forecasts are determined econometrically using an equation and forecasts of their regressors.

Appendix A

Series available in the state forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FABAAD	ABAAD	ABA Delinquency: Automobile - Direct Loans (%, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAADVOL	ABAADVOL	ABA Delinquency: Automobile - Direct Loans, Closed-end (% of $ Volume, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAAI	ABAAIVOL	ABA Delinquency: Automobile - Indirect (%, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAAIVOL	ABAAI	ABA Delinquency: Automobile - Indirect Loans, Closed-end (% of $ Volume, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABABC	ABABC	ABA Delinquency: Bank Card Credit (%, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABABCVOL	ABABCVOL	ABA Delinquency: Bank Card Credit, Open-end (% of $ Volume, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAHE	ABAHE	ABA Delinquency: Home Equity Lines of Credit (%, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAHEVOL	ABAHEVOL	ABA Delinquency: Home Equity Lines of Credit, Open-end (% of $ Volume, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAMH	ABAMH	ABA Delinquency: Mobile Home Loans (%, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAMHVOL	ABAMHVOL	ABA Delinquency: Mobile Home Loans, Closed-end (% of $ Volume, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAPL	ABAPL	ABA Delinquency: Personal Loans (%, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABAPLVOL	ABAPLVOL	ABA Delinquency: Personal Loans, Closed-end (% of $ Volume, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABASU	ABASU	ABA Delinquency: Summary of Accounts (%, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FABASUVOL	ABASUVOL	ABA Delinquency: Summary of Accounts, Closed-end (% of $ Volume, SA)	American Bankers Association: Consumer Credit Delinquency Bulletin; Moody's Analytics
FAHEMF	AHEMF	Avg Hourly Earnings: Manufacturing ($, SA)	Bureau of Labor Statistics; Moody's Analytics
FBIRTHQ	RFBIRTHQ	Births (Ths)	Census Bureau; Moody's Analytics
FBKB13Y	BKB13Y	Bankruptcies: Business - Chapter 13 (#, 12-Mo Ending)	Office of U.S. District Courts; Moody's Analytics
FBKB7Y	BKB7Y	Bankruptcies: Business - Chapter 7 (#, 12-Mo Ending)	Office of U.S. District Courts; Moody's Analytics
FBKBOTHY	BKBOTHY	Bankruptcies: Business - Chapter 11 and 12 (#, 12-Mo Ending)	Office of U.S. District Courts; Moody's Analytics
FBKBY	BKBY	Bankruptcies: Total Business (#, 12-Mo Ending)	Office of U.S. District Courts; Moody's Analytics
FBKP11Y	BKP11Y	Bankruptcies: Personal - Chapter 11 (#, 12-Mo Ending)	Office of U.S. District Courts; Moody's Analytics
FBKP13Y	BKP13Y	Bankruptcies: Personal - Chapter 13 (#, 12-Mo Ending)	Office of U.S. District Courts; Moody's Analytics
FBKP7Y	BKP7Y	Bankruptcies: Personal - Chapter 7 (#, 12-Mo Ending)	Office of U.S. District Courts; Moody's Analytics
FBKPY	BKPY	Bankruptcies: Total Personal (#, 12-Mo Ending)	Office of U.S. District Courts; Moody's Analytics
FBRQ*	RFBRQ	Birthrate (# of Births per 1,000 Population)	Census Bureau; Moody's Analytics
FCCALLQ	RCCALLQ	Consumer Credit: Total ($ Mil, SA)	Federal Reserve Board; Moody's Analytics
FCCNREVQ	RCCNREVQ	Consumer Credit: Nonrevolving ($ Mil, SA)	Federal Reserve Board; Moody's Analytics

Appendix A (Cont.)

Series available in the state forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FCCREVQ	RCCREVQ	Consumer Credit: Revolving ($ Mil, SA)	Federal Reserve Board; Moody's Analytics
FDEATHQ	RFDEATHQ	Deaths (Ths)	Census Bureau; Moody's Analytics
FDEBTC	RCCALLQ	Debt-to-Income Ratio (%)	Bureau of Economic Analysis; Federal Reserve Board; Moody's Analytics
FDPSQ	RDPSQ	Deposits at all Federal Deposit Insurance Corp .-Insured Banks ($ Mil, SAAR)	Federal Deposit Insurance Corp.: Call Reports; Moody's Analytics
FDRQ*	RFDRQ	Death Rate (# of Deaths per 1,000 Population)	Census Bureau; Moody's Analytics
FE22	RE22Q	Employment: Utilities (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FE23	RE23Q	Employment: Construction (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FE333	RE333Q	Employment: Machinery Mfg. (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FE336	RE336Q	Employment: Transportation Equipment Mfg. (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FE42	RE42Q	Employment: Wholesale Trade (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FE51	RE51Q	Employment: Information (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FE81	RE81Q	Employment: Other Services (except Public Administration) (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEEH	REEHQ	Employment: Education & Health Services (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEFI	REFIQ	Employment: Financial Activities (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEGV	REGVQ	Employment: Total Government (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEGVF	REGVFQ	Employment: Federal Government (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEGVL	REGVLQ	Employment: Local Government (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEGVS	REGVSQ	Employment: State Government (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEGVSL	REGVSLQ	Employment: State & Local Government (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FELH	RELHQ	Employment: Leisure & Hospitality (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEMF	REMFQ	Employment: Total Manufacturing (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEMFCE	REMFCEQ	Employment: Chemicals, Energy, Plastics & Rubber Mfg. (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEMFEE	REMFEEQ	Employment: Electronic & Electrical Mfg. (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEMFFB	REMFFBQ	Employment: Food, Beverage & Tobacco Mfg. (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEMFFM	REMFFMQ	Employment: Furniture & Misc. Mfg. (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEMFMM	REMFMMQ	Employment: Metals & Mining-based Mfg. (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEMFTF	REMFTFQ	Employment: Textile, Fiber & Printing Mfg. (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics

Appendix A (Cont.)

Series available in the state forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FEML	REMLQ	Employment: Military (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEOFC	REPSQ	Employment: Office-Using (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEPS	REPSQ	Employment: Professional & Business Services (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FERM	RERMQ	Employment: Natural Resources & Mining (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FERT	RERTQ	Employment: Retail Trade (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FERW	RERWQ	Employment: Transportation & Warehousing (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FET	RETQ	Employment: Total Nonagricultural (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FETL	RETLQ	Employment: Trade, Transportation & Utilities (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FETU	RETUQ	Employment: Transportation & Utilities (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FETP	REGVQ	Employment: Total Private (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FEGOOD	REGOODQ	Employment: Goods Production (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FESERV	RESERVQ	Employment: Services (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FESERVP	REGVQ	Employment: Private Services (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FGDP$Q	RGDP$Q	Gross State Product: Total (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP11$Q	RGDP11$Q	Gross State Product: Agriculture, Forestry, Fishing & Hunting (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP21$Q	RGDP21$Q	Gross State Product: Mining (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP22$Q	RGDP22$Q	Gross State Product: Utilities (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP23$Q	RGDP23$Q	Gross State Product: Construction (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP333$Q	RGDP333$Q	Gross State Product: Machinery Mfg. (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP336$Q	RGDP336$Q	Gross State Product: Transportation Equipment Mfg. (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP42$Q	RGDP42$Q	Gross State Product: Wholesale Trade (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP51$Q	RGDP51$Q	Gross State Product: Information (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDP81$Q	RGDP81$Q	Gross State Product: Other Services (except Public Administration) (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPEH$Q	RGDPEH$Q	Gross State Product: Education & Health Services (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPFI$Q	RGDPFI$Q	Gross State Product: Financial Activities (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPGV$Q	RGDPGV$Q	Gross State Product: Total Government (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPGVF$Q	RGDPGVF$Q	Gross State Product: Federal Government (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics

Appendix A (Cont.)

Series available in the state forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FGDPGVL$Q	RGDPGVL$Q	Gross State Product: Local Government (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPGVS$Q	RGDPGVS$Q	Gross State Product: State Government (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPLH$Q	RGDPLH$Q	Gross State Product: Leisure & Hospitality (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPMF$Q	RGDPMF$Q	Gross State Product: Total Manufacturing (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPMFCE$Q	RGDPMFCE$Q	Gross State Product: Chemicals, Energy, Plastics & Rubber Mfg. (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPMFEE$Q	RGDPMFEE$Q	Gross State Product: Electronic & Electrical Mfg. (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPMFFB$Q	RGDPMFFB$Q	Gross State Product: Food, Beverage & Tobacco Mfg. (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPMFFM$Q	RGDPMFFM$Q	Gross State Product: Furniture & Misc. Mfg. (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPMFMM$Q	RGDPMFMM$Q	Gross State Product: Metals & Mining-based Mfg. (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPMFTF$Q	RGDPMFTF$Q	Gross State Product: Textile, Fiber & Printing Mfg. (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPPS$Q	RGDPPS$Q	Gross State Product: Professional & Business Services (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPQ	RGDPQ	Gross State Product: Total ($ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPRT$Q	RGDPRT$Q	Gross State Product: Retail Trade (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPRW$Q	RGDPRW$Q	Gross State Product: Transportation & Warehousing (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPTL$Q	RGDP42$Q	Gross State Product: Trade, Transportation & Utilities (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FGDPTU$Q	RGDPTU$Q	Gross State Product: Transportation & Utilities (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FIP	RIPM	Industrial Production: Total (2007=100, SA)	U.S. Board of Governors of the Federal Reserve System (Federal Reserve Board); Moody's Analytics (ECCA) Forecast
FHHOLDQ*	RHHOLDQ	Households: Total (Ths)	Census Bureau; Moody's Analytics
FHOFHOPI	HOFHOPI	Federal Housing Finance Agency Conventional and Conforming Home Price Index (1980Q1=100, SA)	Federal Housing Finance Agency; Freddie Mac; Fannie Mae; Moody's Analytics
FXHOFHOPI	HOFHOPI	Federal Housing Finance Agency Conventional and Conforming Home Price Index (1980Q1=100, NSA)	Federal Housing Finance Agency; Freddie Mac; Fannie Mae; Moody's Analytics
FHOFHOPIPO	HOFHOPIPO	Federal Housing Finance Agency Purchase-Only Price Index (1991Q1=100)	Federal Housing Finance Agency; Freddie Mac; Fannie Mae; Moody's Analytics
FXHOFHOPIPO	XHOFHOPIPO	Federal Housing Finance Agency Purchase-Only Price Index (1991Q1=100, NSA)	Federal Housing Finance Agency; Freddie Mac; Fannie Mae; Moody's Analytics
FHPN1	RHPN1M	Residential Permits: Single-family (#, SAAR)	Census Bureau; Moody's Analytics
FHPNM	RHPNMFM	Residential Permits: Multifamily (#, SAAR)	Census Bureau; Moody's Analytics
FHPNR	RHPNRM	Residential Permits: Total (#, SAAR)	Census Bureau; Moody's Analytics
FHST1Q	RHST1M	Housing Starts: Single-family (#, SAAR)	Census Bureau: Housing Starts & Building Permits; Moody's Analytics
FHSTMFQ	RHSTMFM	Housing Starts: Multifamily (#, SAAR)	Census Bureau: Housing Starts & Building Permits; Moody's Analytics

Appendix A (Cont.)

Series available in the state forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FHSTQ	RHSTM	Housing Starts: Total (#, SAAR)	Census Bureau: Housing Starts & Building Permits; Moody's Analytics
FHCMP1Q	RHCMP1M	Housing Completions: Single-family (#, SAAR)	Census Bureau: New Residential Construction; Moody's Analytics
FHCMPMFQ	RHCMPMFM	Housing Completions: Multifamily (#, SAAR)	Census Bureau: New Residential Construction; Moody's Analytics
FHCMPQ	RHCMPM	Housing Completions: Total (#, SAAR)	Census Bureau: New Residential Construction; Moody's Analytics
FHVACRQ	HVACR	Rental Vacancy Rate (%)	Census Bureau; Moody's Analytics
FHX1	RHX1Q	Existing Single-family Home Sales (Ths, SAAR)	National Association of Realtors: Real Estate Outlook; Moody's Analytics
FHX1MED	RHX1MED	Median Existing Single-Family Home Price ($ Ths , SA)	Census Bureau; National Association of Realtors; Moody's Analytics
FHXAFF	RHXAFF	Affordability Index (Index)	Census Bureau; National Association of Realtors; Moody's Analytics
FLBE	LBE	Labor: Number of Employed (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FLBF	LBF	Labor: Civilian Labor Force (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FLBT	LBT	Labor Force Participation Rate (%, SA)	Census Bureau; Bureau of Labor Statistics; Moody's Analytics
FLBR	LBR	Labor: Unemployment Rate (%, SA)	Bureau of Labor Statistics; Moody's Analytics
FXLBR	XLBR	Labor: Unemployment Rate (%, NSA)	Bureau of Labor Statistics; Moody's Analytics
FLBU	LBU	Labor: Number of Unemployed (Ths, SA)	Bureau of Labor Statistics; Moody's Analytics
FUNI	UNI	Labor: Initial Unemployment Claims (#, SA)	Department of Labor; Moody's Analytics
FMBAD	MBAD	MBA: All Loans - Percent of Loans Past Due Total (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD30	MBAD30	MBA: All Loans - Percent of Loans Past Due 30 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD30CP	MBAD30CP	MBA: Conventional Loans: Prime only - Percent of Loans Past Due 30 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD30CS	MBAD30CS	MBA: Conventional Loans: Subprime only - Percent of Loans Past Due 30 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD30F	MBAD30F	MBA: FHA Loans - Percent of Loans Past Due 30 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD30V	MBAD30V	MBA: VA Loans - Percent of Loans Past Due 30 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD60	MBAD60	MBA: All Loans - Percent of Loans Past Due 60 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD60CP	MBAD60CP	MBA: Conventional Loans: Prime Only - Percent of Loans Past Due 60 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD60CS	MBAD60CS	MBA: Conventional Loans: Subprime Only - Percent of Loans Past Due 60 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD60F	MBAD60F	MBA: FHA Loans - Percent of Loans Past Due 60 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD60V	MBAD60V	MBA: VA Loans - Percent of Loans Past Due 60 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD90	MBAD90	MBA: All Loans - Percent of Loans Past Due 90 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics

Appendix A (Cont.)

Series available in the state forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FMBAD90CP	MBAD90CP	MBA: Conventional Loans: Prime Only - Percent of Loans Past Due 90 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD90CS	MBAD90CS	MBA: Conventional Loans: Subprime Only - Percent of Loans Past Due 90 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD90F	MBAD90F	MBA: FHA Loans - Percent of Loans Past Due 90 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAD90V	MBAD90V	MBA: VA Loans - Percent of Loans Past Due 90 Days (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBADCP	MBADCP	MBA: Conventional Loans: Prime Only - Percent of Loans Past Due Total (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBADCS	MBADCS	MBA: Conventional Loans: Subprime Only - Percent of Loans Past Due Total (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBADF	MBADF	MBA: FHA Loans - Percent of Loans Past Due Total (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBADV	MBADV	MBA: VA Loans - Percent of Loans Past Due Total (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAFS	MBAFS	MBA: All Loans - Percent in Foreclosure - Started (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAFSCP	MBAFSCP	MBA: Conventional Loans: Prime Only - Percent in Foreclosure - Started (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAFSCP	MBAFSCP	MBA: Conventional Loans: Prime Only - Percent in Foreclosure - Started (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAFSCS	MBAFSCS	MBA: Conventional Loans: Subprime Only - Percent in Foreclosure - Started (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAFSCS	MBAFSCS	MBA: Conventional Loans: Subprime Only - Percent in Foreclosure - Started (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAFSF	MBAFSF	MBA: FHA Loans - Percent in Foreclosure Started During Quarter (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBAFSV	MBAFSV	MBA: VA Loans - Percent in Foreclosure - Started (%, SA)	Mortgage Banker's Association: National Delinquency Survey; Moody's Analytics
FMBHOMEQ	MBHOMEM	Mobile Home Shipments (#, SAAR)	Institute for Building Technology & Safety: Mobile Home Program Statistics; Moody's Analytics
FMOF14PQ	RMOF14PQ	Mortgage Originations: Purchase ($ Bil, SAAR)	U.S. Department of Housing & Urban Development; Home Mortgage Disclosure Act; Moody's Analytics
FMOF14RQ	RMOF14RQ	Mortgage Originations: Refinance ($ Bil, SAAR)	U.S. Department of Housing & Urban Development; Home Mortgage Disclosure Act; Moody's Analytics
FMOF14TQ	RMOF14TQ	Mortgage Originations: Total ($ Bil, SAAR)	U.S. Department of Housing & Urban Development; Home Mortgage Disclosure Act; Moody's Analytics
FNMDQ*	RNMDQ	Domestic Migration: Net (Ths)	Census Bureau; Moody's Analytics
FNMIQ	RNMIQ	International Migration: Net (Ths)	Census Bureau; Moody's Analytics
FNMQ*	RFNMQ	Total Migration: Net (Ths)	Census Bureau; Moody's Analytics
FPOP0004Q*	RFPOPQ	Population (Resident): Total - Total Age 0 to 4 (Ths)	Census Bureau; Moody's Analytics
FPOP0509Q*	RFPOPQ	Population (Resident): Total - Total Age 5 to 9 (Ths)	Census Bureau; Moody's Analytics
FPOP0519Q*	RFPOPQ	Population (Resident): Age 5 to 19 (Ths)	Census Bureau; Moody's Analytics
FPOP1014Q*	RFPOPQ	Population (Resident): Total - Total Age 10 to 14 (Ths)	Census Bureau; Moody's Analytics
FPOP1519Q*	RFPOPQ	Population (Resident): Total - Total Age 15 to 19 (Ths)	Census Bureau; Moody's Analytics

Appendix A (Cont.)

Series available in the state forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FPOP2024Q*	RFPOPQ	Population (Resident): Total - Total Age 20 to 24 (Ths)	Census Bureau; Moody's Analytics
FPOP2529Q*	RFPOPQ	Population (Resident): Total - Total Age 25 to 29 (Ths)	Census Bureau; Moody's Analytics
FPOP2544Q*	RFPOPQ	Population (Resident): Age 25 to 44 (Ths)	Census Bureau; Moody's Analytics
FPOP3034Q*	RFPOPQ	Population (Resident): Total - Total Age 30 to 34 (Ths)	Census Bureau; Moody's Analytics
FPOP3539Q*	RFPOPQ	Population (Resident): Total - Total Age 35 to 39 (Ths)	Census Bureau; Moody's Analytics
FPOP4044Q*	RFPOPQ	Population (Resident): Total - Total Age 40 to 44 (Ths)	Census Bureau; Moody's Analytics
FPOP4549Q*	RFPOPQ	Population (Resident): Total - Total Age 45 to 49 (Ths)	Census Bureau; Moody's Analytics
FPOP4564Q*	RFPOPQ	Population (Resident): Age 45 to 64 (Ths)	Census Bureau; Moody's Analytics
FPOP5054Q*	RFPOPQ	Population (Resident): Total - Total Age 50 to 54 (Ths)	Census Bureau; Moody's Analytics
FPOP5559Q*	RFPOPQ	Population (Resident): Total - Total Age 55 to 59 (Ths)	Census Bureau; Moody's Analytics
FPOP6064Q*	RFPOPQ	Population (Resident): Total - Total Age 60 to 64 (Ths)	Census Bureau; Moody's Analytics
FPOP65GQ*	RFPOPQ	Population (Resident): Total - Total Age 65 and Older (Ths)	Census Bureau; Moody's Analytics
FPOPQ*	RFPOPQ	Population: Total (Ths)	Census Bureau; Moody's Analytics
FREG	REGCAR	New Vehicle Registrations: Total (#, SAAR)	The Polk Company; Moody's Analytics
FREGCAR	REGCAR	New-Vehicle Registrations: Cars (#, SAAR)	The Polk Company; Moody's Analytics
FREGTCKL	REGTCKL	New-Vehicle Registrations: Light Trucks (#, SAAR)	The Polk Company; Moody's Analytics
FRFHFBE	RIRFHFBEQ	Terms Conventional Mortgages: All Loans - Composite Effective Rate	FHFB: Annual Summary - Terms & Rates on Conventional Mortgages; MA's Estimated & Interpolated
FRTFSQ	RRTFSQ	Retail Sales: Total ($ Bil, SAAR)	Census Bureau; Moody's Analytics
FWRE	YPEWSQ	Effective Wage Rate ($ Ths per Employee)	Bureau of Economic Analysis; Bureau of Labor Statistics; Moody's Analytics
FYFMMEDQ	RYFMMEDQ	Income: Median Family ($, SAAR)	Census Bureau; Moody's Analytics
FYHHAVGQ*	RHHOLDQ	Income: Avg Household ($, SAAR)	Census Bureau; Bureau of Economic Analysis; Moody's Analytics
FYHHMEDQ	RYHHMEDQ	Income: Median Household ($, SAAR)	Census Bureau; Moody's Analytics
FYP$Q	YPQ	Real Personal Income (2009$ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPADJQ	YPADJQ	Income: Residence Adjustment ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPCDPI$Q*	RFPOPQ	Per Capita Disposable Personal Income (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Census Bureau; Moody's Analytics
FYPCDPIQ*	RFPOPQ	Income: Per Capita Disposable ($, SAAR)	Bureau of Economic Analysis; Census Bureau; Moody's Analytics
FYPCONQ	YPCONQ	Income: Contributions for Social Insurance ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics

Appendix A (Cont.)

Series available in the state forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FYPCPI$Q*	RFPOPQ	Per Capita Income (Chained 2009$ Bil, SAAR)	Bureau of Economic Analysis; Census Bureau; Moody's Analytics
FYPCPIQ*	RFPOPQ	Income: Per Capita ($, SAAR)	Bureau of Economic Analysis; Census Bureau; Moody's Analytics
FYPDIRQ	YPDIRQ	Income: Dividends, Interest & Rents ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPDPI$Q	RYPDPIQ	Disposable Personal Income (2009$ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPDPIQ	RYPDPIQ	Income: Disposable Personal ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPEPPFRQ	YPEPPFRQ	Income: Farm Proprietors ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPEPPNFQ	YPEPPNFQ	Income: Nonfarm Proprietors ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPEPPQ	YPEPPQ	Income: Total Proprietors ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPESSQ	YPESSQ	Income: Supplements to Wages & Salaries ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPEWSQ	YPEWSQ	Income: Wages & Salaries ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPNWQ	YPESSQ	Income: Nonwage ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPQ	YPQ	Income: Total Personal ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FYPTRPQ	YPTRPQ	Income: Transfer Receipts ($ Mil, SAAR)	Bureau of Economic Analysis; Moody's Analytics
FTXRE	RYPDPIQ	Effective Tax Rate (%)	Census Bureau; Moody's Analytics
FCPPNOQ	RCPPNOQ	Constr. Put in Place: Private Nonres. - Total ex Comm., Power & Railroads ($ Mil, SAAR)	Census Bureau; Moody's Analytics
Available for California only:			
FHPIVIB	HPIVIB	Nonresidential Permits: Industrial Structures ($ Mil, SAAR)	Construction Industry Research Board; Moody's Analytics
FHPIVMS	HPIVMS	Nonresidential Permits: Misc. Structures ($ Mil, SAAR)	Construction Industry Research Board; Moody's Analytics
FHPIVNL	HPIVNL	Nonresidential Permits: Alterations & Additions ($ Mil, SAAR)	Construction Industry Research Board; Moody's Analytics
FHPIVOF	HPIVOF	Nonresidential Permits: Office Structures ($ Mil, SAAR)	Construction Industry Research Board; Moody's Analytics
FHPIVRT	HPIVRT	Nonresidential Permits: Retail Structures ($ Mil, SAAR)	Construction Industry Research Board; Moody's Analytics
FHPIVT	HPIVT	Nonresidential Permits: Total ($ Mil, SAAR)	Construction Industry Research Board; Moody's Analytics

*Also available at an annual frequency

Source: Moody's Analytics

Appendix B

Series available in the metropolitan area forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FBKB13Y	BKB13Y	Bankruptcies: Business - Chapter 13 (#, 12-Mo Ending)	Administrative Office of U.S. District Courts, Moody's Analytics
FBKB7Y	BKB7Y	Bankruptcies: Business - Chapter 7 (#, 12-Mo Ending)	Administrative Office of U.S. District Courts, Moody's Analytics
FBKBY	BKBY	Bankruptcies: Business - Total (#, 12-Mo Ending)	Administrative Office of U.S. District Courts, Moody's Analytics
FBKP13Y	BKP13Y	Bankruptcies: Personal - Chapter 13 (#, 12-Mo Ending)	Administrative Office of U.S. District Courts, Moody's Analytics
FBKP7Y	BKP7Y	Bankruptcies: Personal - Chapter 7 (#, 12-Mo Ending)	Administrative Office of U.S. District Courts, Moody's Analytics
FBKPY	BKPY	Bankruptcies: Personal - Total (#, 12-Mo Ending)	Administrative Office of U.S. District Courts, Moody's Analytics
FCPIU	RCPIUM	CPI: Total - All Urban Consumers (1982-84=100, SA)	Bureau of Labor Statistics, Moody's Analytics
FE22	RE22Q	Employment: Utilities (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FE23	RE23Q	Employment: Construction (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FE333	RE333Q	Employment: Manufacturing - Machinery (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FE336	RE336Q	Employment: Manufacturing - Transportation Equipment (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FE42	RE42Q	Employment: Wholesale Trade (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FE51	RE51Q	Employment: Information (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FE81	RE81Q	Employment: Other Services (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEEH	REEHQ	Employment: Education & Health Services (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEFI	REFIQ	Employment: Financial Activities (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEGV	REGVQ	Employment: Government - Total (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEGVF	REGVFQ	Employment: Government - Federal (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEGVL	REGVLQ	Employment: Government - Local (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEGVS	REGVSQ	Employment: Government - State (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEGVSL	REGVSLQ	Employment: Government - State & Local (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FELH	RELHQ	Employment: Leisure & Hospitality (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEMF	REMFQ	Employment: Manufacturing - Total (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEMFCE	REMFCEQ	Employment: Manufacturing - Chemicals, Energy, Plastics & Rubber (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEMFEE	REMFEEQ	Employment: Manufacturing - Electronic & Electrical (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEMFFB	REMFFBQ	Employment: Manufacturing - Food, Beverage & Tobacco (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEMFFM	REMFFMQ	Employment: Manufacturing - Furniture & Misc. (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics

Appendix B (Cont.)

Series available in the metropolitan area forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FEMFMM	REMFMMQ	Employment: Manufacturing - Metals & Mining Based (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEMFTF	REMFTFQ	Employment: Manufacturing - Textile, Fiber & Printing (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEML	REMLQ	Employment: Military (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FESERV	RESERVQ	Employment: Services (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEGOOD	REGOODQ	Employment: Goods Production (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FESERVP	RESERVQ	Employment: Private Services (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FETP	RETQ	Employment: Total Private (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEOFC	REPSQ	Employment: Office-Using (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FEPS	REPSQ	Employment: Professional & Business Services (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FERM	RERMQ	Employment: Natural Resources & Mining (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FERT	RERTQ	Employment: Retail Trade (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FERW	RERWQ	Employment: Transportation & Warehousing (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FET	RETQ	Employment: Total Nonagricultural (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FETL	RETLQ	Employment: Trade, Transportation & Utilities (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FETU	RETUQ	Employment: Transportation & Public Utilities (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FGDP$Q	RGDP$Q	Gross Metro Product: Total (Chained 2009 $ Bil, SAAR)	Bureau of Economic Analysis, Moody's Analytics
FGDPQ	RGDPQ	Gross Metro Product: Total ($ Bil, SAAR)	Bureau of Economic Analysis, Moody's Analytics
FHHOLDQ*	RHHOLDQ	Households (Ths)	Census Bureau, Moody's Analytics
FHOFHOPI	RHOFHOPIQ	FHFA Conventional and Conforming Home Price Index (1995Q1=100, SA)	Federal Housing Finance Agency, Freddie Mac, Fannie Mae, Moody's Analytics
FHOFHOPI	RHOFHOPIQ	FHFA Conventional and Conforming Home Price Index (1995Q1=100, NSA)	Federal Housing Finance Agency, Freddie Mac, Fannie Mae, Moody's Analytics
FHOFHOPIPO**	RHOFHOPIPOQ	Federal Housing Finance Agency Purchase-Only Price Index (1991Q1=100)	Federal Housing Finance Agency, Freddie Mac, Fannie Mae, Moody's Analytics
FXHOFHOPIPO**	RXHOFHOPIPOQ	Federal Housing Finance Agency Purchase-Only Price Index (1991Q1=100, NSA)	Federal Housing Finance Agency, Freddie Mac, Fannie Mae, Moody's Analytics
FHPN1	RHPN1M	Permits: Residential - Single-Family (#, SAAR)	Census Bureau, Moody's Analytics
FHPNM	RHPNMFM	Permits: Residential - Multifamily (#, SAAR)	Census Bureau, Moody's Analytics
FHPNR	RHPNRM	Permits: Residential - Total (#, SAAR)	Census Bureau, Moody's Analytics
FHST1Q	RHST1M	Housing Starts: Single-Family (#, SAAR)	Census Bureau, Moody's Analytics
FHSTMFQ	RHSTMFM	Housing Starts: Multifamily (#, SAAR)	Census Bureau, Moody's Analytics

Appendix B (Cont.)

Series available in the metropolitan area forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FHSTQ	RHSTM	Housing Starts: Total (#, SAAR)	Census Bureau, Moody's Analytics
FHCMP1Q	RHCMP1M	Housing Completions: Single-family (#, SAAR)	Census Bureau: New Residential Construction, Moody's Analytics
FHCMPMFQ	RHCMPMFM	Housing Completions: Multifamily (#, SAAR)	Census Bureau: New Residential Construction, Moody's Analytics
FHCMPQ	RHCMPM	Housing Completions: Total (#, SAAR)	Census Bureau: New Residential Construction, Moody's Analytics
FHVACRQ	RHVACRQ	Rental Vacancy Rate (%, SA)	Census Bureau, Moody's Analytics
FHX1	RHX1Q	Home Sales: Existing Single-Family (Ths, SAAR)	National Association of Realtors, Census Bureau, Moody's Analytics
FHX1MED	RHX1MEDQ	Median Existing Single-Family Home Price ($ Ths, SA)	National Association of Realtors, Moody's Analytics
FHXAFF	RHXAFFQ	Affordability Index	National Association of Realtors, Census Bureau, Bureau of Economic Analysis, Moody's Analytics
FLBE	LBE	Employment (Household Survey): Total Employed (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FLBF	LBF	Employment (Household Survey): Labor Force (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FLBR	LBR	Employment (Household Survey): Unemployment Rate (%, SA)	Bureau of Labor Statistics, Moody's Analytics
FXLBR	XLBR	Labor: Unemployment Rate (%, NSA)	Bureau of Labor Statistics, Moody's Analytics
FLBT	RLBTM	Labor Force Participation (%, SA)	Bureau of Labor Statistics, Census Bureau, Bureau of Economic Analysis, Moody's Analytics
FLBU	LBU	Employment (Household Survey): Total Unemployed (Ths, SA)	Bureau of Labor Statistics, Moody's Analytics
FMOF14PQ	RMOF14PQ	Mortgage Originations: Purchase ($ Bil, SAAR)	Moody's Analytics
FMOF14RQ	RMOF14RQ	Mortgage Originations: Refinance ($ Bil, SAAR)	Moody's Analytics
FMOF14TQ	RMOF14TQ	Mortgage Originations: Total ($ Bil, SAAR)	Moody's Analytics
FNMQ*	RNMQ	Net Migration (Ths)	Census Bureau, Moody's Analytics
FPOP0004Q*	RFPOPQ	Population: Ages 0-4 (Ths)	Census Bureau, Moody's Analytics
FPOP0509Q*	RFPOPQ	Population: Ages 5-9 (Ths)	Census Bureau, Moody's Analytics
FPOP0519Q*	RFPOPQ	Population: Ages 5-19 (Ths)	Census Bureau, Moody's Analytics
FPOP1014Q*	RFPOPQ	Population: Ages 10-14 (Ths)	Census Bureau, Moody's Analytics
FPOP1519Q*	RFPOPQ	Population: Ages 15-19 (Ths)	Census Bureau, Moody's Analytics
FPOP2024Q*	RFPOPQ	Population: Ages 20-24 (Ths)	Census Bureau, Moody's Analytics
FPOP2529Q*	RFPOPQ	Population: Ages 25-29 (Ths)	Census Bureau, Moody's Analytics
FPOP2544Q*	RFPOPQ	Population: Ages 25-44 (Ths)	Census Bureau, Moody's Analytics
FPOP3034Q*	RFPOPQ	Population: Ages 30-34 (Ths)	Census Bureau, Moody's Analytics

Appendix B (Cont.)

Series available in the metropolitan area forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FPOP3539Q*	RFPOPQ	Population: Ages 35-39 (Ths)	Census Bureau, Moody's Analytics
FPOP4044Q*	RFPOPQ	Population: Ages 40-44 (Ths)	Census Bureau, Moody's Analytics
FPOP4549Q*	RFPOPQ	Population: Ages 45-49 (Ths)	Census Bureau, Moody's Analytics
FPOP4564Q*	RFPOPQ	Population: Ages 45-64 (Ths)	Census Bureau, Moody's Analytics
FPOP5054Q*	RFPOPQ	Population: Ages 50-54 (Ths)	Census Bureau, Moody's Analytics
FPOP5559Q*	RFPOPQ	Population: Ages 55-59 (Ths)	Census Bureau, Moody's Analytics
FPOP6064Q*	RFPOPQ	Population: Ages 60-64 (Ths)	Census Bureau, Moody's Analytics
FPOP65GQ*	RFPOPQ	Population: Ages 65 and Older (Ths)	Census Bureau, Moody's Analytics
FPOPQ*	RFPOPQ	Population: Total (Ths)	Census Bureau, Moody's Analytics
FYHHMEDQ	RYHHMEDQ	Median Household Income ($, SAAR)	Census Bureau, Moody's Analytics
FYPEWSQ	RYPEWSQ	Income: Wage & Salary Disbursements ($ Mil, SAAR)	Bureau of Economic Analysis, Moody's Analytics
FYPQ	RYPQ	Income: Total Personal ($ Mil, SAAR)	Bureau of Economic Analysis, Moody's Analytics
FYHHAVGQ	RHHOLDQ	Average Household Income ($, SA)	Bureau of Economic Analysis, Census Bureau, Moody's Analytics
FYPNWQ	RYPQ	Income: Nonwage ($ Mil, SAAR)	Bureau of Economic Analysis, Moody's Analytics
FRTFSQ	RRTFSQ	Retail Sales: Total ($ Bil, SAAR)	Census Bureau, Moody's Analytics
FBIRTHQ	RFBIRTHQ	Births (Ths)	Census Bureau, Moody's Analytics
FDEATHQ	RFDEATHQ	Deaths (Ths)	Census Bureau, Moody's Analytics
FDRQ	RDRQ	Death Rate (# of Deaths per 1,000 Population)	Census Bureau, Moody's Analytics
FBRQ	RBRQ	Birthrate (# of Births per 1,000 Population)	Census Bureau, Moody's Analytics
FDPSQ	RDPSQ	Quarterly Deposits at All Federal Deposit Insurance Corp.-Insured Banks ($ Ths, SAAR)	Federal Deposit Insurance Corp., Moody's Analytics
FYP$Q	RYPQ	Income: Total Personal (2009 $ Mil, SAAR)	Bureau of Economic Analysis, Moody's Analytics
FYPCPIQ*	RFPOPQ	Income: Per Capita ($, SAAR)	Bureau of Economic Analysis, Census Bureau, Moody's Analytics
FYPCPI$Q*	RFPOPQ	Income: Per Capita (2009 $, SAAR)	Bureau of Economic Analysis, Census Bureau, Moody's Analytics
FYPDPIQ	RYPDPIQ	Disposable Personal Income ($ Mil, SAAR)	Bureau of Economic Analysis, Moody's Analytics
FYPDPI$Q	RYPDPIQ	Disposable Personal Income (2009 $ Mil, SAAR)	Bureau of Economic Analysis, Moody's Analytics
FBKP11Y	BKP11Y	Bankruptcies: Personal - Chapter 11 (#, 12-Mo Ending)	Administrative Office of U.S. District Courts, Moody's Analytics
FBKBOTHY	BKB11Y	Bankruptcies: Business - Chapter 11 and 12 (#, 12-Mo Ending)	Administrative Office of U.S. District Courts, Moody's Analytics

Appendix B (Cont.)

Series available in the metropolitan area forecast database

Forecast mnemonic	Based on historical mnemonic	Series description and units	Sources
FHPIVIB	HPIVIB	Nonresidential Permits: Industrial Structures ($ Mil, SAAR)	Construction Industry Research Board, Moody's Analytics
FHPIVMS	HPIVMS	Nonresidential Permits: Misc. Structures ($ Mil, SAAR)	Construction Industry Research Board, Moody's Analytics
FHPIVNL	HPIVNL	Nonresidential Permits: Alterations & Additions ($ Mil, SAAR)	Construction Industry Research Board, Moody's Analytics
FHPIVOF	HPIVOF	Nonresidential Permits: Office Structures ($ Mil, SAAR)	Construction Industry Research Board, Moody's Analytics
FHPIVRT	HPIVRT	Nonresidential Permits: Retail Structures ($ Mil, SAAR)	Construction Industry Research Board, Moody's Analytics
FHPIVT	HPIVT	Nonresidential Permits: Total ($ Mil, SAAR)	Construction Industry Research Board, Moody's Analytics

*Also available at an annual frequency
**Available for only 100 metro areas

Source: Moody's Analytics

About the Authors

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