

METHODOLOGY

Expanding and Regionalizing the Federal Reserve CCAR Scenarios

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Summary

As part of its annual Comprehensive Capital Analysis and Review, the Federal Reserve (Fed) publishes summary information on three macroeconomic forecast scenarios for the U.S. economy, a base case, and two adverse scenarios. Moody's Analytics expands each of these scenarios to produce forecasts for the full set of more than 1,500 variables found in our own macroeconomic forecasts. Moody's Analytics will then use the results as drivers for its other forecasts, including variables for U.S. states, metropolitan areas, housing, and consumer credit.

The following is a summary of the process used to perform these tasks.

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Macroeconomic scenarios

We begin by reviewing the data from the Fed's scenarios to verify that they make sense in terms of recent economic history and current conditions

The approach to expanding the Fed scenarios to produce three sets of macroeconomic forecasts for the full set of more than 1,500 variables found in our own forecasts involves entering the Fed data into the Moody's Analytics macroeconometric model. This model is structural in nature, meaning that variables are linked with one another via regression equations whose explanatory variables are intuitive in terms of basic macroeconomics. For example, inflation-adjusted consumer expenditure on household services is a function of inflation-adjusted disposable income, population, cash flow, and household net worth. Further, the model is bottom-up, for example, total inflation-adjusted consumer expenditure is the sum of expenditures on durable goods, nondurable goods, and services. Many variables for which the Fed supplies scenarios are aggregates, such as inflation-adjusted GDP. As a result, the process of inputting Fed scenarios requires adjusting more granular variables such as inflation-adjusted consumer services and inflation-adjusted business equipment investment.

The process involves the following steps. At each step, the model is re-simulated to produce interim results.

1. The Fed's forecasts for variables that are less influenced by changes in the pace of U.S. economic activity, such as its forecast or scenario for global economic activity, are put into the Moody's Analytics model.
2. The Fed's forecasts for variables such as the Treasury bill rate that are heavily influenced by Fed policy are put into the Moody's Analytics model.
3. The Fed's forecasts for variables which would otherwise come directly from econometric equations, such as the 10-year Treasury yield, are put directly into the model. For any variable for which the Fed provides a forecast, but for which we do not, Moody's Analytics will use the closest comparable variable. For example, we do not forecast the Fed's house price series. We set the percentage changes in the house price series that are in our model equal to the percentage changes in the Fed's house price series.
4. The model is adjusted to reflect the Fed's inflation forecasts. To align the model-based results more closely to the Fed's scenarios, adjustments will be made to the CPI for consumer services. Though this variable is not strictly a driver variable, its forecast is a major determinant of the other price indexes and deflators.
5. The Fed's forecasts for the unemployment rate are input via adjustment of the forecast for household employment. Also, the implied percentage changes in household employment will be imposed on payroll employment for consistency.
6. The Fed's forecasts for real GDP are input by adjusting the various line items of national spending—consumer spending, business investment, government, exports, imports, and inventories. The basic approach is to take the percentage difference between the Fed scenario for real GDP and the interim model-based results and apply it to each line item of spending. However, the adjustments will not be identical line by line because some categories of spending such as consumption of durables and business equipment spending are more cyclical than, consumption of services. Furthermore, the Moody's Analytics model is simultaneous, that is, "everything depends on everything else." As a result, the model will be re-simulated multiple times to readjust for multiplier effects to get the Moody's Analytics model-based forecast to converge to the Fed scenarios.

By using the sequential process described above, Moody's Analytics will line up model-based macroeconomic forecasts to the Fed scenarios and in the process preserve as much as possible the relationships embodied in the regression equations in the model.

The next steps will be to run the results of the Moody's Analytics model-based macroeconomic forecasts through its models that forecast state and metropolitan area economic activity, housing, and consumer credit.

Regional economic scenarios

The Moody's Analytics regional forecasting models produce forecasts of state and metropolitan area measures of general economic activity, including state and metro area real output, employment by industry, and housing construction, among other variables. The models use a set of sequential, top-down, structural, panel econometric models that take the U.S. macroeconomic forecast as their exogenous input. For example, output by industry in the macro model is a driver of output and employment by industry at the state level. The top-down feature means that there is no feedback to the macro forecast.

The process of producing state and metropolitan area economic scenarios consistent with the Fed's CCAR macro scenarios involves the following steps.

1. The results of each of the U.S. macroeconomic CCAR scenarios are put into the state model, which is then simulated to produce state-level CCAR forecasts.
2. The results of the state-level CCAR forecasts are then exogenous inputs into the top-down metropolitan areas models, one for each state. Those models are then simulated. For example, output by industry in a given state model is a driver of output and employment by industry at the metropolitan area level.

Housing scenarios

The model-based CCAR results at the macroeconomic, state, and metropolitan area levels serve as exogenous inputs into the Moody's Analytics econometric model that is used to determine regional house prices. This is a structural model of housing demand and supply that allows for serial correlation and mean reversion in individual metropolitan area housing markets¹. The model identifies the forces driving house prices, including persistent ones such as household and income growth, and more temporal forces related to business cycles such as the jobless rate and the foreclosure rate.

In contrast with the state and metropolitan area economic forecasts, the housing model first produces forecasts of individual metropolitan area house prices, from which state house price forecasts are then determined. This is done because metropolitan areas are the most dominant economic and residential markets within a state and drive the state price forecasts. The forecast model assumes that there is a close relationship between the metro area's house prices and the state's house prices.

The model that generates the house price scenario is designed with several goals in mind. First, the regional house price scenario should be broadly consistent with the U.S. house price scenario. Specifically, rank ordering of regional house price forecasts across scenarios should generally follow rank ordering of the U.S. house prices across scenarios. Second, regional economic, and demographic factors should have an impact on the house price scenarios. The house price scenarios should reflect differences across scenarios of regional economic drivers such as the jobless rate or employment. Third, the model should be quick to implement and generate a scenario in a timely manner. To this end, the regional scenario model takes a share-down approach. The ratio used to share out the regional baseline house price forecast to the scenario forecast combines the U.S. house price baseline-to-scenario forecast ratio and the region's baseline-to-scenario forecast ratios for economic drivers.

¹ For more detail, see <http://www.economy.com/home/products/samples/case-shiller-methodology.pdf>

Consumer credit scenarios

CreditForecast.com, a joint product of Equifax and Moody's Analytics, contains history and forecasts for a wide range of household consumer credit, economic and demographic variables at a detailed level of geography. Equifax, the large consumer credit reporting agency, aggregates information on outstanding balances and performance each month along several key dimensions, including product type, quarter of origination (or vintage), geographic location (state, metropolitan area, or rest of state), borrower's credit score at origination, and borrower's current credit score. More than 40 performance metrics are available within each of these cohorts, providing users of the database insights on consumer credit trends down to a detailed level. For example, a subscriber to the CreditForecast.com service can examine the number of credit card accounts that were opened in the second quarter of 2011, in the Philadelphia metro area, with a credit score of less than 620, that are 30 days delinquent.

We have developed a unique econometric approach to forecast the performance of this consumer credit data under various economic scenarios, including CCAR. The models consider the performance of loans within each of the homogenous product-vintage-geography-credit score segments by capturing the effect that origination credit quality, economic conditions at origination, and time-varying economic factors have on performance throughout a five-year forecast period. Models are uniquely specified for each performance metric to best capture the drivers of performance for a particular product segment². For example, the model for credit card originations might be tied to consumer spending levels and retail sales. Auto lending might be impacted by the unemployment rate as well as gasoline prices and interest rates.

All economic data used in the CreditForecast.com models are measured down to the state and metropolitan area level to maintain consistency with the geographic area under consideration. Five-year forecasts of origination volume, balances, delinquencies, defaults, and prepayments are generated by applying alternative economic scenarios to the estimated models. The state- and metropolitan-level scenarios described in the previous section are exogenous inputs to the CreditForecast.com econometric models to provide forecasts consistent with the Fed's CCAR process.

² Additional details regarding the CreditForecast.com data and econometric modeling process are available at <http://www.economy.com/home/pro/getfile.asp?fid=F2CE38FB-E9AE-4ABA-9254-2344B550A02D>

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Celia speaks regularly at Moody's Analytics client conferences and has provided economic commentary on Wall Street Radio, Bloomberg and CNBC. Celia completed her PhD at the University of Pennsylvania, with a concentration in econometrics and international finance. She holds a bachelor's degree in economics from Barnard College.

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