Forecast Methodology

For over 30 years, McGraw-Hill Construction forecasts have been serving the industry's strategic, market planning, and analytical needs with comprehensive projections of building activity for virtually all geographies and construction categories. Driving the industry's most respected forecasts and analysis is the McGraw-Hill Construction Forecasting Group – comprised of six professional economists who offer decades of experience and education relating to econometric forecasting and statistical analysis of the construction industry.

What Distinguishes McGraw-Hill Construction From Other Forecasters?
As a result of the richness and depth of our historical data set, McGraw-Hill Construction is uniquely positioned to forecast domestic construction market activity. With consistent time series data available monthly back to 1967, our forecasting models are specified and estimated based on the most comprehensive historical database available anywhere. Moreover, by tracking building projects as they move through the different stages of planning, bidding, and construction, our network of hundreds of Dodge reporters brings another dimension to the forecasting process that is unrivaled in the marketplace. Our unique "pre-start" perspective allows us to statistically estimate the probability that individual construction projects will ever break ground, and to time how long they will take to do so from any particular planning stage. This pre-start information provides the McGraw-Hill Construction forecasting team with a notable advantage over others who attempt to forecast construction activity.

National and Regional Forecasts
The construction forecasts created by McGraw-Hill Construction Research and Analytics are based on both a top-down and a bottom-up statistical approach. As a first step, regression techniques are used to create econometric models for 22 major building categories at the national level and for each of the nine regions of the country. Every quarter, our economists add in the most recent historical data and employ these econometric techniques to generate a five-year outlook of construction value, square footage, and dwelling units. Under the guidance of our chief economist, Robert Murray, our five economists specialize in particular building categories within the residential, nonresidential, or nonbuilding (engineering) segments of construction, and are responsible for analyzing trends, identifying key economic, demographic and policy drivers, and providing recommendations for the outlook of those building types. Mr. Murray oversees the process and provides the ultimate direction for the five-year forecast.

The U.S. level forecast is generated first and serves as the constraint for each of the nine regional outlooks. All of the forecasts are internally consistent, with the sum of the regions totaling to the outlook for the nation. We also ensure that the value, square footage, and unit forecasts are internally consistent by forecasting square footage or units first, then a cost per square foot or square foot per unit that is applied to the original forecast.

The forecasts for key economic drivers to the construction forecasts – independent variables such as interest rates, household formation rates, population/employment growth, GDP, and government expenditures are all provided by Economy.com, a macroeconomic consulting company located in West Chester, PA.

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In combination with this top-down, econometric forecasting technique, McGraw-Hill Construction Research & Analytics uses a "bottom-up" or "pre-start" approach to enhance its short-term outlook (1-2 years). This approach utilizes the largest ($5 million and above) construction projects still in the planning stages, as tracked by our network of MHC Dodge reporters, to adjust the short-term results of the econometric models. By weighting these projects based on their likelihood of breaking ground, and adjusting for the amount of time it will take a project to move from any particular stage to construction start, the individual projects are summed up to estimate their overall impact on a geographic area and/or building type. These bottom-up totals provide our economists with a unique frame of reference for analyzing local construction markets and assessing our model-generated forecasts.

State and Metropolitan Area Forecasts

Once the U.S. and nine-region forecasts are complete, two subsequent econometric forecasting processes begin. First, we forecast all seven nonbuilding categories, five institutional categories, as well as auto and manufacturing construction within each of the 50 states. Second, we create forecasts for four commercial property types, residential construction, and healthcare within the 54 largest metropolitan areas of the nation (in terms of building activity). The procedures used for state and metropolitan level forecasting are very similar to the national and regional forecasting system described above.

Individual equations for each geography and building type are econometrically specified and estimated based on the McGraw-Hill Construction historical statistics. In addition, as with the national process, the near-term model-generated forecasts are enhanced by benchmark comparisons to the bottom-up aggregation of individual pre-start projects. And finally, the independent economic variables that drive the local forecast models are also incorporated from Economy.com.

Throughout every level of geography and across all construction categories, the McGraw-Hill Construction forecasts are internally consistent – states sum up to regions, and regions add up to the U.S. totals. Constraining mechanisms within the econometric models ensure this consistency.

County Level Forecasts

Unlike other levels of geography, construction forecasts for counties are not generated using individually specified econometric equations, but instead are derived from a large-scale shift-share model. The shift-share methodology "shares down" a larger aggregate forecast (the state, metro area, or regional forecast) based upon the relative historical shares of its individual components (the counties that comprise the aggregate).

Shift-share identifies a county's short-term and long-term historical share of a state's or metropolitan area's or region's construction activity, then creates a linear function that brings the county's current share of activity up or down to its long-term share over the forecast horizon. From those shares, it estimates county level construction by multiplying the appropriate share by the state/metro/regional forecast.

In addition, the near-term construction outlook for counties is again enhanced by the McGraw-Hill Construction Dodge pre-start construction project detail. Particularly at the county level,

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knowing the types and sizes of projects being planned, and understanding how rapidly they are moving through the approvals process, helps enormously in determining the near-term construction outlook for a given area.

Custom forecasts

In some cases, we produce projections on a custom basis for segments of the data that slice below the standard 22 forecast categories. Examples of these types of projections would include: breaking out the education forecast into primary and secondary schools, disaggregating the dollars spent for new construction versus alterations for any forecast category, breaking out low-rise versus high-rise projects, etc.

The methodology employed in these cases is the same shift-share approach used to create the county-level forecasts described above. The historical shares (long-term and short-term) that the lower level project type (or other relevant data cut) has represented of the corresponding more aggregate forecast is calculated and then a linear function brings that share from its recent short-term share up to or down to the long-term share. This time series projection of the share is then applied to the forecast of the more aggregate category to produce a simple forecast baseline.

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Forecast project types

Forecast Group	Econometric Models Below Regional level by State or MSA
Stores and Restaurants	MSA
Warehouses (excl. manufacturer owned)	MSA
Office and Bank Buildings	MSA
Parking Garages and Automotive Services	State
Manufacturing Plants, Warehouses, Labs	State
Schools, Libraries, and Labs (nonmfg)	State
Hospitals and Other Health Treatment	State
Government Service Buildings	State
Religious Buildings	State
Amusement, Social and Recreational Bldgs	State
Miscellaneous Nonresidential Buildings	State
Hotels and Motels	MSA
Dormitories	State
One-family Houses	MSA
Multifamily	MSA
Streets and Highways	State
Bridges	State
Dams/Reservoirs/River Development	State
Sewerage and Waste Disposal Systems	State
Water Supply Systems	State
Power Plants/Gas/Communications	State
Other Nonbuilding	State

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MSAs econometrically modeled for selected project types

MSA #	Metropolitan Area
12060	Atlanta-Sandy Springs-Marietta, GA
12420	Austin-Round Rock, TX
12580	Baltimore-Towson, MD
13820	Birmingham-Hoover, AL
14260	Boise City, ID
14460	Boston-Brockton-Nashua, MA-NH
15980	Cape Coral, FL
16700	Charleston, SC
16740	Charlotte-Gastonia-Concord, NC-SC
16980	Chicago-Naperville-Joliet, IL-IN-WI
17140	Cincinnati-Middletown, OH-KY-IN
17460	Cleveland-Elyria-Mentor, OH
18140	Columbus, OH
19100	Dallas-Fort Worth-Arlington, TX
19740	Denver-Aurora, CO
19820	Detroit-Warren-Livonia, MI
25060	Gulfport-Biloxi
25540	Hartford-West Hartford-East Hartford, CT
26420	Houston-Baytown-Sugar Land, TX
26900	Indianapolis, IN
27260	Jacksonville, FL
28140	Kansas City, MO-KS
29820	Las Vegas-Paradise, NV
31100	Los Angeles-Long Beach-Santa Ana, CA
31140	Louisville, KY
32820	Memphis, TN
33100	Miami-Fort Lauderdale-Miami Beach, FL
33340	Milwaukee-Waukesha-West Allis, WI
33460	Minneapolis-St. Paul-Bloomington, MN-WI
34980	Nashville-Davidson--Murfreesboro, TN
35380	New Orleans-Metairie-Kenner, LA
35620	New York-Northern New Jersey-Long Island, NY-NJ-PA
36420	Oklahoma City, OK
36740	Orlando, FL
37980	Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
38060	Phoenix-Mesa-Scottsdale, AZ
38300	Pittsburgh, PA
38900	Portland-Vancouver-Beaverton, OR-WA
39580	Raleigh-Cary, NC
40060	Richmond, VA
40140	Riverside-San Bernardino-Ontario, CA
40900	Sacramento--Arden-Arcade--Roseville, CA
41180	St. Louis, MO-IL

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41620 Salt Lake City, UT
41700 San Antonio, TX
41740 San Diego-Carlsbad-San Marcos, CA
41860 San Francisco-Oakland-Fremont, CA
41940 San Jose-Sunnyvale-Santa Clara, CA
42660 Seattle-Tacoma-Bellevue, WA
45300 Tampa-St. Petersburg-Clearwater, FL
46140 Tulsa, OK
47260 Virginia Beach-Norfolk-Newport News, VA-NC
47900 Washington-Arlington-Alexandria, DC-VA-MD-WV