

A Guide to *Metropolitan Area Markets For Cement, Concrete & Stone*

By
Robert Roy
R.O.I. Economic Consulting
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Thank you for purchasing *Metropolitan Area Markets for Cement, Concrete & Stone*. Depending on what you ordered, you may be looking at a report encompassing anywhere from only a single U.S. metropolitan area to as much as five thick volumes covering five different building materials -- portland cement, masonry cement, aggregate, ready-mix concrete, and "other" concrete -- for 330 metropolitan areas. This brief guide explains the methodology used to derive these metropolitan area estimates and forecasts.

High freight costs dictates market proximity

Cement rarely is shipped more than 100 miles from the plant or distribution terminal to the customer. For concrete and aggregate, the distances from supplier to customer are even less. Aggregate quarries and ready-mix concrete batch plants are located near the metropolitan areas they serve. Portland and masonry cement may be shipped from a plant in an outlying county, but cement plants typically are within a 100-mile radius of their main urban markets.

The vast majority of cement is shipped by truck. U.S. Geological Survey (USGS) data for 2001 indicate that 95.8% of cement shipments to consumers were by truck. Rail transport accounted for 2.2%, while barges transported 2.0%, a tenfold increase from 2000. Rail and barge transport were more important in 2001 shipments between cement plants and terminals: 52.0% for rail, 35.1% for barge, and 12.9% for truck.

Shipping cement by truck even 50 miles can add \$10 per ton to the delivered cost, a significant amount for a \$70 per ton product. The freight economics for ready-mix concrete and aggregate are even steeper as the distance between customer and supplier increases.

What about imports?

Foreign cement imports are an important supply source for U.S. cement companies, satisfying 21%-26% of domestic demand. Except for a small percent of cement from Mexico and Canada, imports are shipped here by ship or barge to domestic cement plants or terminals, frequently traveling thousands of miles.

Once the cement imports are delivered to the local cement plant or terminal, they are shipped by truck to the customer, no different from domestic product. The freight economics over land are the same.

Stick close to home

Cement, concrete, and aggregate all have low value by weight. Consequently, freight costs rise rapidly as delivery distance increases. Being close to customers is a significant competitive advantage. Only premium-priced, specialty concrete products, cements, and stones can economically travel great distances. These premium products are a tiny percentage of total sales. The rest must ship to customers near plants, terminals, and quarries to avoid substantial delivery costs.

Metropolitan area markets are most relevant

Given the short distances that cement, concrete and stone travel from plant to customer, metropolitan areas are obviously the most relevant market areas for suppliers. One cement plant may sell throughout an entire state, but it is rare for an aggregate or concrete operation to sell beyond the nearest metro area. With access to rail or barge transport, a cement plant may expand its market greatly using distribution terminals in distant urban markets, but this is exceptional. For the terminal, moreover, the relevant market is its immediate metro area.

No metro area data collected

The USGS does a great job of collecting data on cement and aggregate, but state level information is the best geographic detail available¹. Only national data are collected by the Census Bureau on concrete. Thus, building materials companies do not have information on their metropolitan area markets, even though this is most relevant to them. They cannot even compute their market shares because they don't know how big the market is. Furthermore, they don't know how fast their markets have been growing, or how cyclical they are. They cannot compare one metro area market to another. All they can do is assume that what they experience individually as companies is true for the total market. This is a dangerous assumption. It means you are assuming market shares and growth rates are constant.

If there are no measures of past or present metro area market size and growth, how can forecasts be made? Companies need projections of future growth for budgeting and planning purposes for current operations. When making acquisitions or expanding into new markets, forecasts are also critical.

Estimates need to be made

With no actual metro area data collected, estimates have to be made. What is the best method? I believe *Metropolitan Area Markets for Cement, Concrete & Stone* uses the best methodology available. The estimates in this report were made using a statistical technique called multiple linear regression (MLR). It makes best use of the information that is available. MLR models are also known as econometric or ordinary least squares (OLS) models. Goodness-of-fit statistics measure how well the models fit the data. They are usually referred to as R^2 , F , or t statistics.

Econometric models work best when there is a sound theoretical basis for the functional form of the model. Rather than randomly picking variables to explain cement (or concrete or aggregate) demand based on correlations, the explanatory variables should be selected based on a theory of what determines demand. The theory can be based on esoteric mathematical models or simply on experience and common sense. The estimated models should confirm the correctness of the theory by fitting the historical data well.

The determinants of building materials demand

Building materials demand is generated by construction activity. A variety of factors influence the level of construction: interest rates, unemployment, job growth, tax policy, government spending, regional cost of living differences, etc. Most of these factors influence the cyclicity of building activity, e.g. booms and busts, expansions and recessions. Some of the factors are national in influence, e.g. interest rates and monetary policy. Most of the factors have a local aspect as well as state and federal, e.g. job growth, unemployment, and taxes. There is competition among cities, states, and regions for construction contracts. Some areas have a comparative advantage over others, which benefits construction activity.

All of the above factors are essentially short-term or intermediate-term influences on the business cycle for construction. What are the long-term influences on construction? Population is the most important long-term determinant of construction activity. Population size and growth determine the need for most types of construction, e.g. housing, retail, roads, offices, schools, sewers, hospitals, etc. Population is the primary driving force behind virtually all construction activity over the long-run.

¹ There are a few exceptions. The USGS does report on cement shipments for northern and southern California, northern and southern Texas, eastern and western Pennsylvania, Chicago and downstate Illinois, as well as eastern, western, and metropolitan New York. Aggregate data are only reported by state.

Technological change is another long-term influence on construction and other economic activity. Innovation generates new building needs as well as demand for new equipment and consumer products. Unfortunately, there are no measures of technological change or innovation at the state or local level. Even national measurements are “shaky”.

Building state-level models

Some people might build one national model of cement (or concrete or aggregate) demand and then apply it to every state and metropolitan area. Decades of experience have shown me that national models of building materials demand perform poorly. There is far too much regional, state, and local variation in building materials markets to be captured by a national model.

Econometric models of local markets would be best, but this is impossible because there are no data collected for cement, concrete, and stone demand at the metro area level. Thus, there are no “dependent” variables for the local models, the variables you are trying to explain. However, relevant “independent” variables (explanatory variables) do exist for metropolitan areas, namely, population and construction activity.

That leaves state-level regression models as the best alternative. There are accurate measures of cement and stone shipments from the USGS, as well as good measures of population and construction activity. There are no state-level data collected for concrete, however.

Thus, I have estimated regression models by state for portland cement, masonry cement, and aggregate. That’s roughly 150 equations. While some have better statistical properties than others, all have good statistical and theoretical characteristics.

The state concrete estimates are derived from USGS data on the amount of portland cement sold to ready-mix concrete and “other” concrete customers. USGS reports these data by state. I assume that a cubic yard of concrete uses 500 lbs. of portland cement, i.e. a ton of portland cement yields four cubic yards of concrete. Thus, my estimates are simply four times the USGS data. I realize that the use of fly ash and other admixtures makes my estimates of concrete use low, but this cannot be helped. There are no good measures of fly ash use in concrete at the state level. However, you can adjust my figures based on your own knowledge of fly ash use in a particular metropolitan area.

Making metro area estimates

The state-level regression models are used to make metropolitan area estimates of cement, concrete, and stone consumption. While the process is somewhat more complicated than simply plugging the metro area population and construction data into its state model, which is basically what is done.

One complicating factor is model error. The state models fit the historical data well but not perfectly. Typically, the models explain 80% to 90% of the yearly variation in state cement and stone consumption. I spread the error proportionately among the state’s metro areas, so that everything adds up correctly.

Forecasts

Five-year forecasts of cement, concrete and stone are also supplied in this report. The basis of the forecast is my latest *U.S. Cement Forecast*. This report gives state-by-state portland cement forecasts for 30 years using three different scenarios: baseline, better, and worse. I use the baseline forecast in metro area reports. The economic assumptions underlying the state forecasts are described in detail in *U.S. Cement Forecast*.

The state-level masonry cement, aggregate and concrete forecasts are all derived from the portland cement forecasts. The metropolitan area forecasts are calculated in a similar manner to the historical estimates with one exception: the metro area forecasts take into account differences in population growth rates among cities within a state compared to the state average. Thus, the fastest-growing metro areas in a state have relatively better building materials forecasts.

Population and construction activity

The explanatory variables for all of these regression models are population and construction activity. The report gives 1982-2002 data for population and residential building. Homebuilding is separated into single-family and multi-family units. A five-year population forecast is also presented.

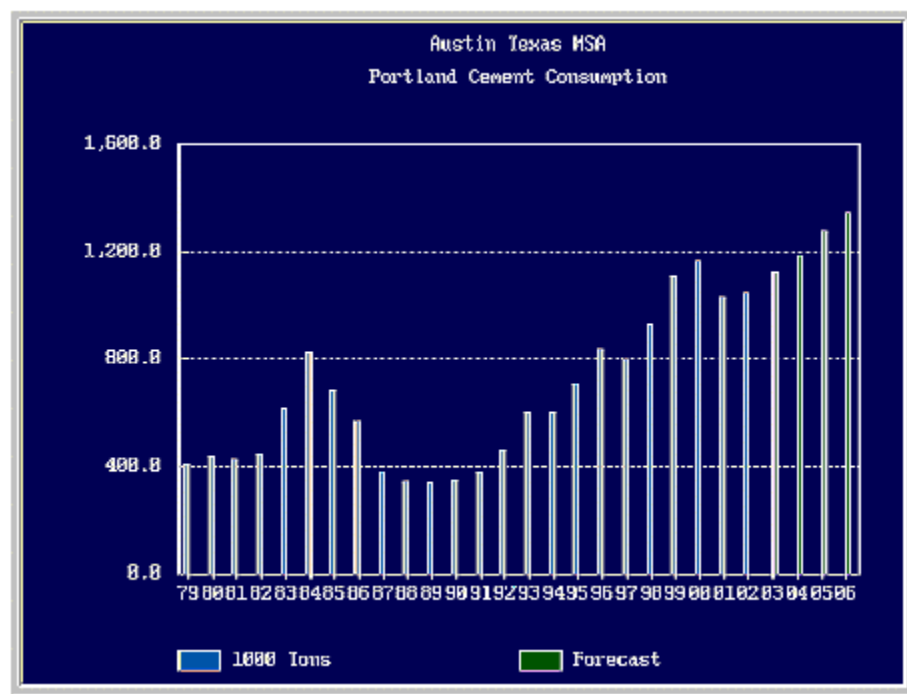
The changing definition of a metropolitan area

The Office of Management and Budget (OMB) is the U.S. government agency responsible for defining metropolitan areas. These definitions are revised periodically. New metro areas are added and old ones are redefined. Except for New England, all metropolitan statistical areas (MSAs) are defined to include whole counties. Adding a whole county to a metro area can mean a large jump in population, construction activity, and building materials consumption.

My estimates carefully take into account all changes in the definitions of U.S. metropolitan areas since 1979. Changes are most obvious when a metro area's population suddenly jumps from one year to the next. This happened to several MSAs in 1993.

The calculation of compound growth rates will be distorted when a MSAs definition is changed. If a county is added, the long-term growth rate will be artificially boosted. Keep this in mind.

When OMB adds new metropolitan areas, I make new estimates of their building materials use. When metro area estimates do not go back to 1979, it is because the city was not yet designated a MSA by OMB.



Summary statistics

The latest edition of *Metropolitan Area Markets for Cement, Concrete & Stone* presents historical estimates from 1982 to 2002 and forecasts from 2003 to 2007. The 2003 forecasts are based on partial-year actual data by state. Annual percent changes are shown from 1992 to 2007. The complete range of historical estimates is 1979-2002, and I have computed two summary statistics: annual averages and compound annual growth rates for this range. Annual averages give an indication of the long-run average size of metro area markets. Compound growth rates are calculated using OLS on the logarithms of the 1979-2002 estimates.

Conclusion

Metropolitan Area Markets for Cement, Concrete & Stone is unique. No other product estimates history and gives forecasts by metropolitan area for portland cement, masonry cement, aggregate, ready-mix concrete, and “other” concrete.

Please send me your comments and suggestions so that this report can keep improving.

