Benchmarking Construction Cost Changes in the U.S. South

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[As published in *American Reconstruction*, September 2006]

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Executive Summary

Recent increases in construction costs associated with Hurricane Katrina raised questions regarding the specific factors driving these costs and the potential to forecast construction costs generally in the U.S. South. Previous research highlights the difficulties with estimating future construction costs and the importance of establishing sufficient contingency funds or risk management plans. In addition, current analysis generates insights regarding factors driving construction costs: The most significant factors are materials, labor, equipment used and the characteristics of the individual contracts; energy costs play a disproportionate role in total construction spending because of their impact on petroleum-derived products, machinery costs, and transportation costs; contractors enjoyed moderate materials cost increases in 2001-2003 and failed to adequately prepare for unexpected price increases in 2004-2005; price impacts from Katrina appear to be short-term for building materials, while the impacts on labor costs beyond twelve months remain unclear; using construction cost indices in tandem with economic market analysis provides a useful approach for gauging short-term costs.

Introduction

The devastating impact of Hurricane Katrina in August 2005 highlighted concerns regarding the capacity and costs to rebuild the affected region, as well as the residual effects on current and future construction projects across the Southeast. While Katrina's impact on the overall economy and construction market remains unclear, the tangible damage dwarf losses from previous U.S. natural disasters (Table 1).

Table 1. Housing units and buildings destroyed in selected U.S. natural disasters[1]

Event (Year)	Homes/Buildings Destroyed
San Francisco earthquake/fire (1906)	28,000
Hurricane Andrew (1992)	28,000+
Hurricanes Jeanne + Ivan + Frances + Charley (2004)	27,500
Hurricane Katrina (2005)	200,000+

Sources: NAHB; American Red Cross

[1] "Destroyed" means uninhabitable. The Red Cross notes that the number of homes with major but reparable damage in 1992 and 2004 was more than twice the number destroyed.

What has been the impact of hurricanes previous to Katrina on construction costs in the U.S. South? In the three months following Hurricane Andrew in 1992, the average price for plywood increased nearly 45% and softwood lumber rose nearly 17%. However, similar price increases did not occur following the hurricanes in 2004 (NAHB 2005). Rather, prices fell once reconstruction began. Why? Higher prices in strong housing markets in the years preceding 2004 encouraged producers across products to increase capacity, leading to ample supply of construction materials.

If we know the construction industry can adjust supplies to meet demand, what opportunities exist to forecast construction input prices? Previous research documents the difficulties with estimating future construction costs. AbouRizk et al (2002) studied the accuracy of cost estimates for major municipal projects – including drainage, roadways and buildings – in Edmonton. In comparing estimated against actual costs incurred, the research indicated that estimates systematically under priced projects.[2] Wilmot and Cheng (2003), in modeling future highway construction costs in Louisiana, found that cost estimates erred because they were not accurate – inputs were not priced correctly – and because the estimates failed to capture how project costs increase over time. In other words, historical data shows that most input prices increase at a rate faster than inflation, and construction cost estimates studied by Wilmot and Cheng failed to account for this.

What else affects actual and estimated construction costs? Variation in the number of bids from year to year (Olsen and Epps 1981); government regulations, changes to construction plans, quality of the contractor management team, emphasis on construction deadlines, and the quality and timeliness of project information (Koehn et al. 1978; Elhag and Boussebaine 1998); and qualitative factors such as the need a contractor has for a contract at a given point in time and the relationship between the agency issuing the contract and the contractor can materially impact construction costs (Fayek 1998).

However, the most significant factors affecting construction costs are materials, labor, equipment used and the characteristics of the individual contracts, such as contract size, duration, and location. In sum, while the economic and regulatory environment in which a contract is signed matters, understanding future construction costs clearly begins with quantifying the future prices of key construction inputs.

Construction Cost Forecasts and Indices

In practice, the construction industry relies on forecasts from surveys, cost indices and economic market analyses to estimate future costs. For example, consider recent forecasts associated with the effects of Hurricane Katrina on construction costs in the U.S. South:

Surveys. Surveys of managers of public educational, transportation and municipal entities indicated bids on public construction projects rose by an average of 13.2% between August 2004 and August 2005 (Reid 2005). Of those surveyed, 48% identified

[2] With respect to the construction phase of building projects, 73% were within 10% of estimated costs, while 4% were over-budgeted on average and 15% were under-budgeted on average.

oil and gas prices as the key factor behind higher construction bids, while 35% cited steel prices and 8% cited cement.

Cost indices. Impacts from Katrina varied across product indices. For example, regional shortages and tight markets resulted in higher cement prices – up 14.5% for the year – but the price tracking showed the price moves occurred prior to Katrina. This indicates the impacts will be New Orleans specific, as rebuilding efforts rely on imports, and structural factors limit these volumes to the current inflow of 35 million tons per year (Grogan and Angelo 2005). New Orleans was the fourth largest port in the U.S. and handled imported construction materials that must now be directed to other ports, resulting in higher delivered costs for these products.[3]

Ken Simonson, Chief Economist of The Associated General Contractors of America (AGC) analyzed construction costs from 2001 to 2005 to address significant cost increases in 2004 and 2005 relative to overall inflation (Doyle 2005). In comparing the CPI (consumer price index) and PPI (producer price index for finished goods) against a range of construction material indices, Simonson found that consumer prices increases remained moderate throughout. Alternately, construction costs rose dramatically in 2004 and/or 2005 after having tracked the overall PPI for three years. After modest changes between 2001 and 2003, the prices of key construction materials spiked in 2004 and 2005. As a result, few contractors made sufficient provisions for price increases in 2004, resulting in unexpected cost increases.

Economic market analysis. While Katrina "disrupted" labor and construction material markets, it has not produced a structural shift. Rather, materials and labor are flowing into the affected region. According to the Bureau of Labor Statistics, construction employment is at a record high of 7.3 million white and blue-collar workers as of August 2005. This represents a 4.0% increase over August 2004. The longer-term impact of Katrina will be reflected in the additional costs associated with the delay in deliveries and extension of project timelines rather than increases in direct material costs.

Construction industry economists and analysts aggregate data from these surveys, cost indices and market analytics to develop forecasts of the short-term (6-24 months) step changes associated with Hurricane Katrina (Table 2).

Table 2: Forecasted effects of Hurricane Katrina on construction costs

Firm/organization (City)	Forecast
PinnacleOne (Phoenix, AZ)	+10-20% over next 12-24 months
David Landon (Sacramento, CA)	+5-10% in Southeast over next 24 months for non-residential construction
Boyken International (Atlanta, GA)	+15% across projects (breakdown: +8-10% over next 6 months for commercial building materials; +20% for labor)

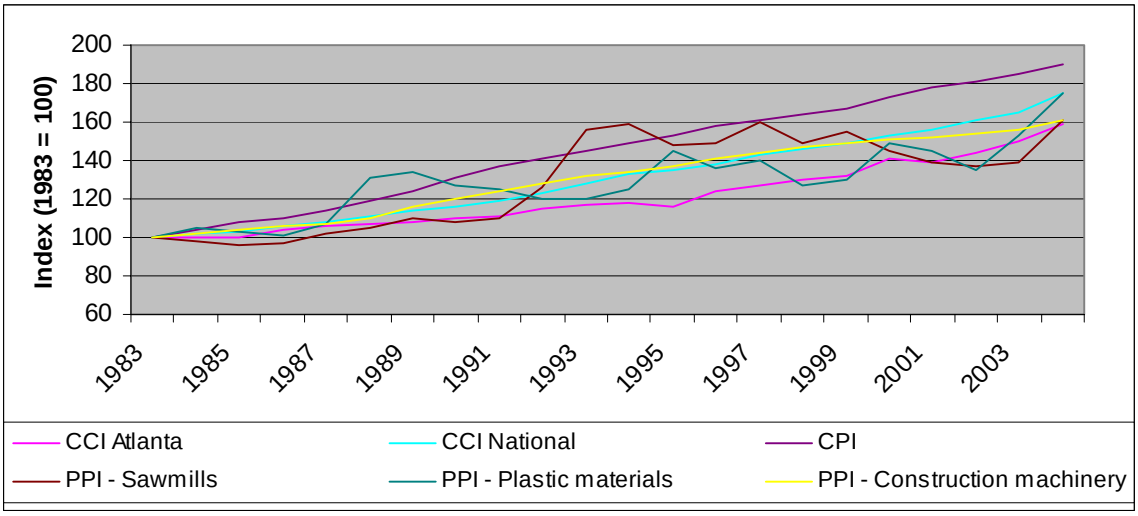
Source: Grogan and Angelo 2005

[3] In 2004, New Orleans was the top destination for imports of cement. The New Orleans and Mobile customs districts reported about 12 percent of national cement imports in 2004.

Indices that track the actual costs of key construction inputs provide a useful means for gauging relative construction costs. The Engineering News-Record (ENR) publishes a Construction Cost Index and Building Cost Index for the U.S. and twenty major cities including Atlanta. The CCI and BCI differ only in their labor component. The CCI uses 200 hours of common labor, while the BCI uses 68.38 hours of skilled labor. For materials, both indexes use fabricated standard structural steel, bulk portland cement and locally priced 2x4 lumber. Both indexes apply to general construction costs. While the CCI can be used where labor costs are a high proportion of total costs, the BCI is more applicable for structures. These indices are best used for year-to-year trends and to provide a relative measure of construction costs between cities.[4]

When overall construction costs change in the past as observed in construction cost indices such as ENR, it is easy to see how year to year volatilities differ from standard measures of inflation (CPI, consumer price index; PPI, various producer price indices) and input costs (Figure 1). This figure makes the point that the common assumption that construction costs track inflation can lead to poor estimates of future construction costs.

Figure 1. CCI indexed against key measures of inflation, 1983-2004



Use of the construction cost indices benefit from the context provided by relevant market analysis. For example, consider how the short-term spike in the sawmill PPI (Figure 1) can be put into a long-term/short-term perspective. Forest industry economists at RISI view impacts on wood-based products as short-term, and the data supports this perspective. The extended strength of the housing market resulted in forest product manufacturers investing in mills to expand capacity. This has produced growing supplies of lumber and panels, which will drive prices down; the industry can build 2.1 million

[4] The indices are not seasonally adjusted. Wages, the most important component, usually affect the numbers once or twice a year. Cement prices tend to change in the spring while structural steel pricing tends to adjust monthly. Lumber prices, more dependent on local pricing and production, are the most volatile and can change significantly monthly. Declines in the indices are most often the result of falling lumber prices.

[housing] units per year and, even accounting for Katrina, the number of homes built will fall significantly below that in 2006 (Grogan and Angelo 2005).

Key Insights and Conclusions

Hurricanes Katrina affected the supplies of construction inputs – such as fuel, cement, steel and wood products – more than the capacity to produce these inputs. In other words, the hurricanes impacted the ability to get these inputs where they are wanted when they are wanted more than the ability to produce them in the first place. This indicates that **prices impacts from Katrina are short-term with respect to construction materials**. Examples from Hurricane Katrina demonstrate how understanding the capacity of the region – through an economic market analysis – provides the hard data required to identify the source and estimate the duration of cost changes appearing in standard indices.

Energy costs drive construction costs. Contractors report that the higher diesel fuel costs affect work costs more significantly than changes in costs for petroleum derived products themselves. Fuel increases affected severely contractors who make significant use of earthmovers, highway contractors and dump trucks (McFall 2005). However, the impacts on material costs are indeed significant: petroleum-based products include plastic construction products such as PVC water and sewer pipe; steel production is energy intensive; lumber costs are sensitive to transport costs. Volatile energy prices result in volatile construction costs.

Construction managers can mitigate price risk. The financial risk associated with construction projects encourages contractors and owners to seek strategies for mitigation, such as the allocation of a contingency amount. Sometimes called an "engineering reserve," contingency allocations are used to mitigate uncertainties associated with project costs, especially in early phases of development (Nassar 2002). When actual construction falls behind schedule, it is often due to unexpected costs. Ali (2005) notes a tendency to arbitrarily identify risks, whereas effective risk management plans explicitly identify the financial exposures. Specifically, these can include energy costs, labor costs and delays.

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