PRIORITY MIDLAND
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Current and Projected Construction Costs in Midland Compared to Other Areas of Texas

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Introduction

The Midland area has been among the fastest growing regions in the United States, both in terms of its population and economy. Current high levels of activity in the oil industry, together with technological changes and other advances, are combining to generate increases in production of global significance.

As a result, the population and economy of the area is expanding substantially faster than most parts of Texas and the nation. The Perryman Group's most recent forecast for the area indicates that rapid growth is likely to continue.

While economic expansion involves opportunities, it also presents challenges. The unemployment rate for Midland remains well below most areas of the state and nation. In fact, present levels are not sustainable over an extended period. Labor shortages have emerged in many sectors, and difficulty finding workers is a common problem in the area. One outcome of the situation is that costs of many kinds are rising. In particular, the cost of construction has been affected. The situation is exacerbated by the fact that the skills required in the construction sector have substantial overlap with those in the oil and gas industry.

The Perryman Group was recently asked to examine patterns in construction costs in Midland compared to other major population centers and the state of Texas as a whole. **The Perryman Group's analysis indicates that construction costs in the Midland area are significantly higher than in other parts of the state and are likely to rise more rapidly in the future.**

Impact of the Petroleum Sector

Oil and gas exploration and production and related activity are major drivers of the Midland and Permian Basin economies. The total economic impact of the sector is integral to the analysis of current and potential future construction costs and is therefore included in the initial phases of this analysis. Any business activity generates additional effects through the economy. Oil and gas related activity in the Permian Basin leads to an increase in opportunities for businesses of many kinds. For the Midland area, construction needs are generated by the industry both directly and indirectly through effects on economic growth patterns.

The Perryman Group examined the economic impact of the petroleum sector including major categories such as exploration and production, pipelines, oilfield services, and others. The impact results were utilized in the forecasting process to more fully quantify the role of the energy sector on the overall economy as well as construction costs.[1]

When multiplier effects are considered, the total current impact of the energy sector on the Midland Metropolitan Statistical Area (Midland and Martin counties) was found to include an estimated **$49.9 billion** in annual gross product and over **98, 910** jobs when multiplier effects are considered. Activity across the Permian Basin generates demand for construction materials and workers based in Midland, thereby affecting construction costs. For the Permian Basin Region, the petroleum sector generates an estimated **$63.7 billion** in gross product each year and over **175,360** jobs, including multiplier effects. Additional results are provided in the following table, with information regarding methods used briefly described on page 4 with additional detail in the Appendices.

[1] This impact evaluation was originally developed as part of the "Priority Midland by the Numbers" project currently being conducted by The Perryman Group.

The Annual Impact (as of 2019) of the Petroleum Sector on Business Activity in the Midland MSA and Permian Basin Region

Results by Key Indicator

Indicator	Midland MSA	Permian Basin Region
Total Expenditures	$206.545 b	$260.517 b
Gross Product	$49.865 b	$63.730 b
Personal Income	$24.447 b	$31.666 b
Jobs	98,914	175,363

Source: US Multi-Regional Impact Assessment System, The Perryman Group
Notes: Monetary values given in billions of 2019 US dollars per year.

Measuring Economic and Fiscal Impacts

Any economic stimulus, whether positive or negative, generates multiplier effects throughout the economy. In this instance, various aspects of the energy sector (such as exploration, production, pipelines, services, and others) lead to multiplier effects rippling through the economy.

The Perryman Group's input-output assessment model (the US Multi-Regional Impact Assessment System) was used to estimate the total economic benefits of the energy sector. The model, which is described in further detail in the Appendices to this report, was developed by the firm about 40 years ago and has been consistently maintained and updated since that time. The model has been used in hundreds of analyses for clients ranging from major corporations to government agencies. It uses a variety of data (from surveys, industry information, and other sources) to describe the various goods and services (known as resources or inputs) required to produce another good/service. This process allows for estimation of the total economic impacts (including multiplier effects). The models used in the current analysis reflects the specific industrial composition and characteristics of the Midland MSA and Permian Basin Region economies.

Total economic effects are quantified for key measures of business activity:

- **Total expenditures** (or total spending) measure the dollars changing hands as a result of the economic stimulus.
- **Gross product** (or output) is production of goods and services that will come about in each area as a result of the activity. This measure is parallel to the gross domestic product numbers commonly reported by various media outlets and is a subset of total expenditures.
- **Personal income** is dollars that end up in the hands of people in the area; the vast majority of this aggregate derives from the earnings of employees, but payments such as interest and rents are also included.
- **Job gains** are expressed as job-years of employment for a temporary or multi-year stimulus (such as construction or a cumulative impact) or jobs for effects that would be ongoing.

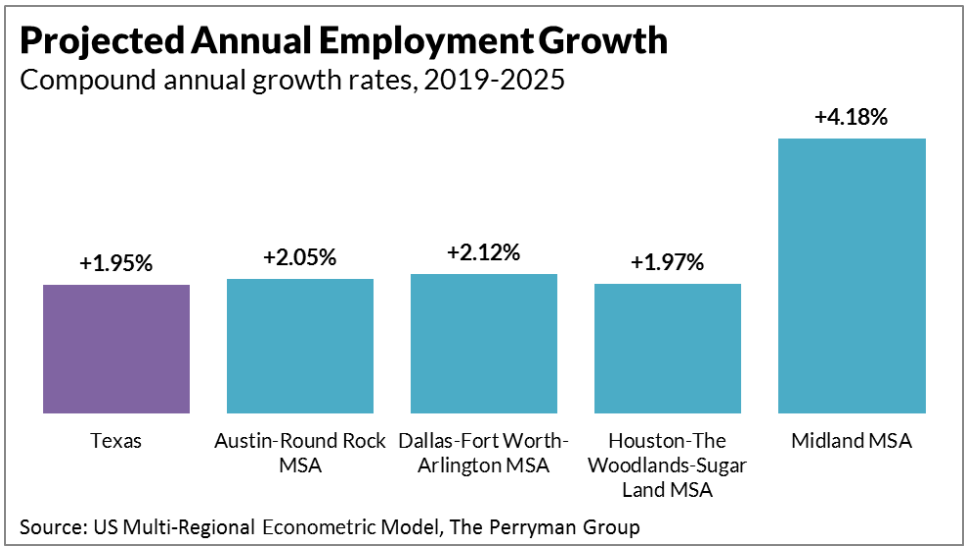
Monetary values were quantified on a constant (2019) basis to eliminate the effects of inflation. See the Appendices for additional information regarding the methods and assumptions used in this analysis.

Economic Forecast

Economic conditions are one driver of costs of certain goods and services, including construction. When rapid growth in the economy leads to high demand and therefore rising wages for workers with needed skills, for example, costs rise.

The Perryman Group utilized its US Multi-Regional Econometric Model to generate forecasts for Midland and other metropolitan areas of interest in this analysis. The model provides detailed estimates of current and likely future activity across the economy, including in specific construction categories.

The Texas economy is performing well, and all of the state's metropolitan areas are expected to see notable economic growth. Even so, the projected pace of expansion in the Midland Metropolitan Statistical Area (MSA) is significantly faster. Through 2025, employment in the Midland MSA is expected to increase at a 4.18% annual pace, compared to 1.95% projected for Texas.[2] Other large population centers are forecast to expand by 2.05% (Austin-Round Rock), 2.12% (Dallas-Fort Worth-Arlington), and 1.97% (Houston-The Woodlands-Sugar Land).



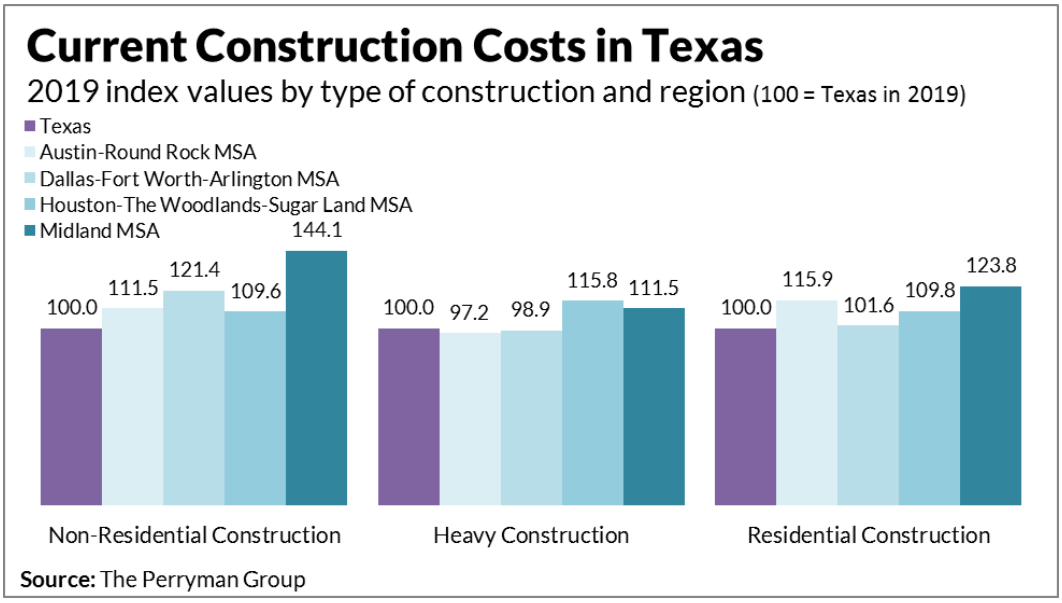
[2] This forecast is based on a Baseline Oil Price Scenario and assumes that local efforts to respond to growth challenges will be implemented.

Forecast employment for these areas by sector is included in the Appendices to this report.

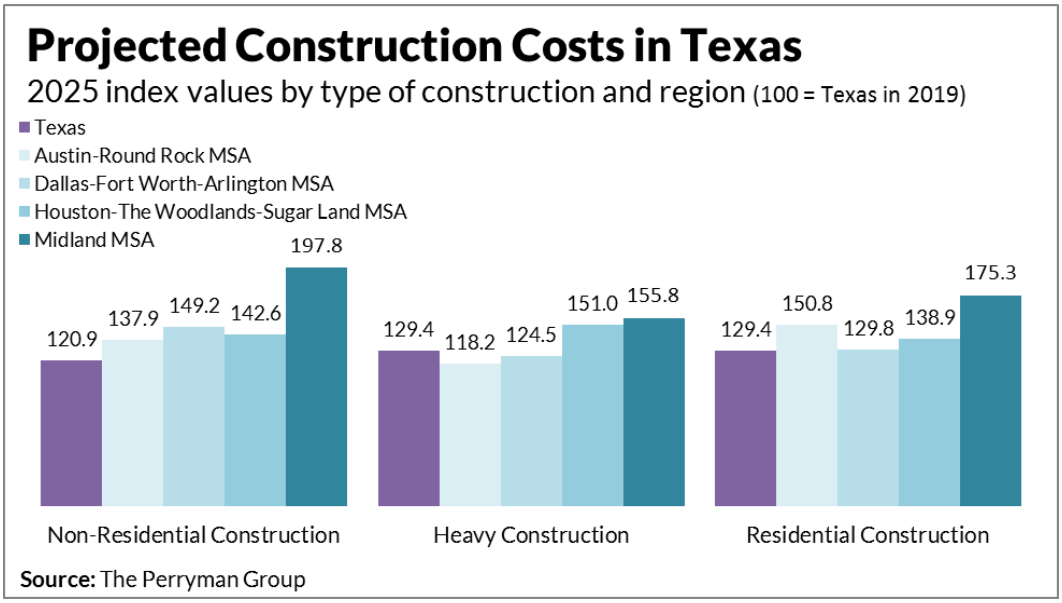
Construction Cost Index

Based on expected patterns in the economy, The Perryman Group estimated likely changes in construction costs and developed a construction cost index. The index (with 2019 Texas statewide construction costs by type equal to 100) allows for comparison on an "apples-to-apples" basis across various geographic areas. These costs do not reflect land value due to the significant variations in costs within each of the areas.

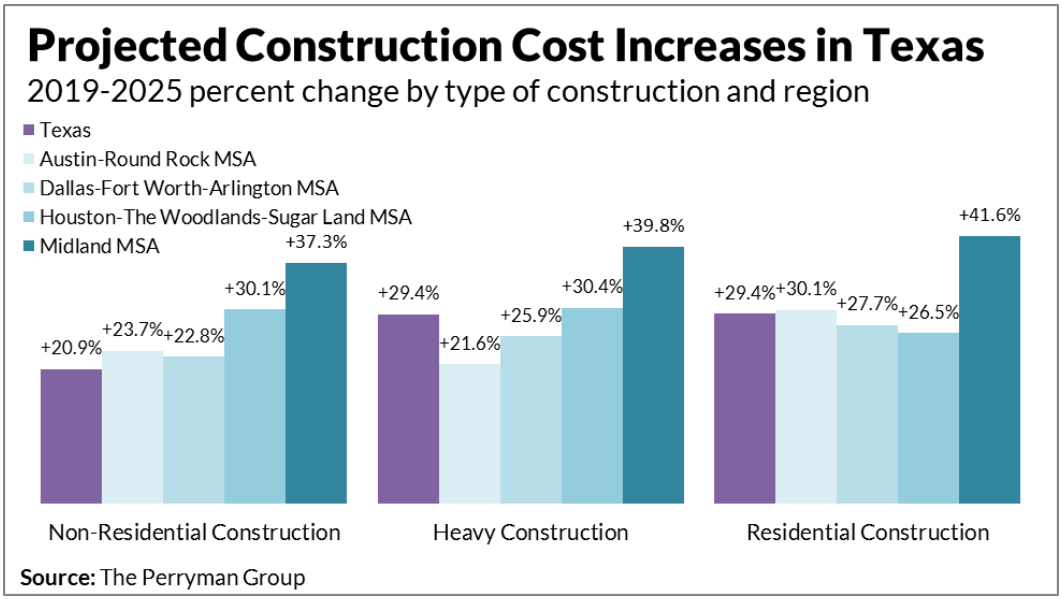
The cost of non-residential construction in Midland is currently estimated to be 44.1% higher than the statewide level, while heavy construction (largely infrastructure) is 11.5% higher and residential construction is 23.8% higher. Costs of construction in Midland are also significantly above other large population centers including the Austin-Round Rock, Dallas-Fort Worth-Arlington, and Houston-The Woodlands-Sugar Land MSAs.



By 2025, the costs of construction in Midland are expected to exceed costs in other parts of the state by an even greater margin. The Midland cost index for non-residential construction is projected to reach 197.8, which is 97.8% higher than the current (2019) level of non-residential construction for the state. Heavy construction and residential costs are also likely to continue to exceed costs in other parts of the state, including the other major metropolitan areas analyzed.



While costs are projected to rise in all of the metropolitan areas examined, Midland's rate of growth clearly outpaces the other population centers. Over the 2019-2025 time period, the non-residential construction cost index for Midland is expected to increase by 37.3%, compared to 20.9% for Texas and between 22.8% and 30.1% for the other areas studied. Heavy construction costs in the Midland area are likely to rise by 39.8%, significantly outpacing Texas (up 29.4%) and the other areas. Midland MSA residential construction costs are expected to increase even faster, up 41.6% by 2025, compared to 29.4% for Texas and between 26.5% and 30.1% for the other areas.



Construction Cost Index Values

Results by region and year (100 = Texas in 2019)

Region	Year	Non-Residential	Heavy (Infrastructure)	Residential
Texas	2019	100.0	100.0	100.0
	2020	103.0	104.6	104.6
	2021	106.2	109.3	109.3
	2022	109.6	114.1	114.1
	2023	113.2	119.1	119.1
	2024	117.0	124.2	124.2
	2025	120.9	129.4	129.4
Austin-Round Rock	2019	111.5	97.2	115.9
	2020	115.6	100.5	121.2
	2021	119.8	103.9	126.7
	2022	124.2	107.4	132.5
	2023	128.6	110.9	138.4
	2024	133.2	114.5	144.5
	2025	137.9	118.2	150.8
Dallas-Fort Worth-Arlington	2019	121.4	98.9	101.6
	2020	125.8	102.9	105.9
	2021	130.2	106.9	110.4
	2022	134.8	111.2	115.0
	2023	139.5	115.5	119.8
	2024	144.3	120.0	124.7
	2025	149.2	124.5	129.8
Houston-The Woodlands-Sugar Land	2019	109.6	115.8	109.8
	2020	114.6	121.1	114.3
	2021	119.8	126.7	118.9
	2022	125.2	132.4	123.7
	2023	130.8	138.4	128.6
	2024	136.6	144.6	133.7
	2025	142.6	151.0	138.9
Midland	2019	144.1	111.5	123.8
	2020	144.7	115.1	127.4
	2021	155.0	122.9	136.5
	2022	165.0	130.6	145.5
	2023	175.5	138.6	154.9
	2024	186.4	147.0	164.9
	2025	197.8	155.8	175.3

Source: The Perryman Group

Conclusion

The rapidly growing economy of Midland presents not only opportunities, but also challenges. The Perryman Group's latest forecasts call for continued expansion outpacing most parts of Texas.

Construction costs are currently higher in Midland than in other areas and are likely to rise faster over the next few years.

Construction costs are currently substantially higher in Midland than in other major population centers and for the state as a whole. Moreover, The Perryman Group's analysis indicates that they are likely to rise faster through 2025.

Appendices

Appendix A: Methods Used

US Multi-Regional Impact Assessment System

In addition to quantifying the effects of the oil and gas sector, the USMRIAS was used in the quantification of the relevant price indices. Specifically, the price coefficients of the various cost components (such as labor and materials for each category of construction) are extracted from the system and aggregated into a composite form for each of the relevant areas (Texas and the Midland, Austin-Round Rock, Dallas-Fort Worth-Arlington, and Houston-The Woodlands-Sugar Land MSAs). They are then converted to an index format which assigns the Texas costs in 2019 a value of 100, with all other areas measured relative to this benchmark. They are then projected forward using the appropriate sub-models of the US Multi-Regional Econometric Model (described below). This analysis is conducted for Non-Residential Buildings, Heavy (Infrastructure) Construction, and Residential Construction.

The basic modeling technique employed in the economic impact portion of this study is known as dynamic input-output analysis. This methodology essentially uses extensive survey data, industry information, and a variety of corroborative source materials to create a matrix describing the various goods and services (known as resources or inputs) required to produce one unit (a dollar's worth) of output for a given sector. Once the base information is compiled, it can be mathematically simulated to generate evaluations of the magnitude of successive rounds of activity involved in the overall production process.

There are two essential steps in conducting an input-output analysis once the system is operational. The first major endeavor is to accurately define the levels of direct activity to be evaluated. In this case, data from the US Department of Commerce and the US Department of Labor for various energy segments was obtained, as well as proprietary output information maintained by The Perryman Group.

The second major phase of the analysis is the simulation of the input-output system to measure overall economic effects of the direct cost reductions and productivity gains. The present study was conducted within the context of the US Multi-Regional Impact Assessment System (USMRIAS) which was developed and is maintained by The Perryman Group. This model has been used in hundreds of diverse applications across the country and has an excellent reputation for accuracy and credibility; it has also been peer reviewed on multiple occasions. The

systems used in the current simulations reflect the unique industrial structure of the Midland MSA and Permian Basin Region economies.

The USMRIAS is somewhat similar in format to the Input-Output Model of the United States and the Regional Input-Output Modeling System, both of which are maintained by the US Department of Commerce. The model developed by TPG, however, incorporates several important enhancements and refinements. Specifically, the expanded system includes (1) comprehensive 500-sector coverage for any county, multi-county, or urban region; (2) calculation of both total expenditures and value-added by industry and region; (3) direct estimation of expenditures for multiple basic input choices (expenditures, output, income, or employment); (4) extensive parameter localization; (5) price adjustments for real and nominal assessments by sectors and areas; (6) measurement of the induced impacts associated with payrolls and consumer spending; (7) embedded modules to estimate multi-sectoral direct spending effects; (8) estimation of retail spending activity by consumers; and (9) comprehensive linkage and integration capabilities with a wide variety of econometric, real estate, occupational, and fiscal impact models. Moreover, the model uses specific local taxing patterns to estimate the fiscal effects of activity on a detailed sectoral basis. The models used for the present investigation have been thoroughly tested for reasonableness and historical reliability.

The impact assessment (input-output) process essentially estimates the amounts of all types of goods and services required to produce one unit (a dollar's worth) of a specific type of output. For purposes of illustrating the nature of the system, it is useful to think of inputs and outputs in dollar (rather than physical) terms. As an example, the construction of a new building will require specific dollar amounts of lumber, glass, concrete, hand tools, architectural services, interior design services, paint, plumbing, and numerous other elements. Each of these suppliers must, in turn, purchase additional dollar amounts of inputs. This process continues through multiple rounds of production, thus generating subsequent increments to business activity. The initial process of building the facility is known as the *direct effect*. The ensuing transactions in the output chain constitute the *indirect effect*.

Another pattern that arises in response to any direct economic activity comes from the payroll dollars received by employees at each stage of the production cycle. As workers are compensated, they use some of their income for taxes, savings, and purchases from external markets. A substantial portion, however, is spent locally on food, clothing, health care services, utilities, housing, recreation, and other items. Typical purchasing patterns in the relevant areas are obtained from the *ACCRA Cost of Living Index*, a privately compiled inter-regional measure

which has been widely used for several decades, and the *Consumer Expenditure Survey* of the US Department of Labor. These initial outlays by area residents generate further secondary activity as local providers acquire inputs to meet this consumer demand. These consumer spending impacts are known as the *induced effect*. The USMRIAS is designed to provide realistic, yet conservative, estimates of these phenomena.

Sources for information used in this process include the Bureau of the Census, the Bureau of Labor Statistics, the Regional Economic Information System of the US Department of Commerce, and other public and private sources. The pricing data are compiled from the US Department of Labor and the US Department of Commerce. The verification and testing procedures make use of extensive public and private sources.

Impacts were measured in constant 2019 dollars to eliminate the effects of inflation.

The USMRIAS generates estimates of the effect on several measures of business activity. The most comprehensive measure of economic activity used in this study is **Total Expenditures**. This measure incorporates every dollar that changes hands in any transaction. For example, suppose a farmer sells wheat to a miller for $0.50; the miller then sells flour to a baker for $0.75; the baker, in turn, sells bread to a customer for $1.25. The Total Expenditures recorded in this instance would be $2.50, that is, $0.50 + $0.75 + $1.25. This measure is quite broad but is useful in that (1) it reflects the overall interplay of all industries in the economy, and (2) some key fiscal variables such as sales taxes are linked to aggregate spending.

A second measure of business activity frequently employed in this analysis is that of **Gross Product**. This indicator represents the regional equivalent of Gross Domestic Product, the most commonly reported statistic regarding national economic performance. In other words, the Gross Product of Texas is the amount of US output that is produced in that state; it is defined as the value of all final goods produced in a given region for a specific period of time. Stated differently, it captures the amount of value-added (gross area product) over intermediate goods and services at each stage of the production process, that is, it eliminates the double counting in the Total Expenditures concept. Using the example above, the Gross Product is $1.25 (the value of the bread) rather than $2.50. Alternatively, it may be viewed as the sum of the value-added by the farmer, $0.50; the miller, $0.25 ($0.75 - $0.50); and the baker, $0.50 ($1.25 - $0.75). The total value-added is, therefore, $1.25, which is equivalent to the final value of the

bread. In many industries, the primary component of value-added is the wage and salary payments to employees.

The third gauge of economic activity used in this evaluation is **Personal Income**. As the name implies, Personal Income is simply the income received by individuals, whether in the form of wages, salaries, interest, dividends, proprietors' profits, or other sources. It may thus be viewed as the segment of overall impacts which flows directly to the citizenry.

The fourth measure, **Retail Sales**, represents the component of Total Expenditures which occurs in retail outlets (general merchandise stores, automobile dealers and service stations, building materials stores, food stores, drugstores, restaurants, and so forth). Retail Sales is a commonly used measure of consumer activity.

The final aggregates used are **Jobs and Job-Years** of employment, which reflect the full-time equivalent jobs generated by an activity. For an economic stimulus expected to endure (such as the ongoing operations of a facility), the Jobs Measure is used. It should be noted that, unlike the dollar values described above, Jobs is a "stock" rather than a "flow." In other words, if an area produces $1 million in output in 2018 and $1 million in 2019, it is appropriate to say that $2 million was achieved in the 2018-19 period. If the same area has 100 people working in 2018 and 100 in 2019, it only has 100 Jobs. When a flow of jobs is measured, such as in a construction project or a cumulative assessment over multiple years, it is appropriate to measure employment in Job-Years (a person working for a year, though it could be multiple people working for partial years). This concept is distinct from Jobs, which anticipates that the relevant positions will be maintained on a continuing basis.

US Multi-Regional Econometric Model

Overview

The US Multi-Regional Econometric Model (also known as the Texas Econometric Model) was developed by Dr. M. Ray Perryman, President and CEO of The Perryman Group (TPG), about 40 years ago and has been consistently maintained, expanded, and updated since that time. It is formulated in an internally consistent manner and is designed to permit the integration of relevant global, national, state, and local factors into the projection process. It is the result of four decades of continuing research in econometrics, economic theory, statistical methods, and key policy issues and behavioral patterns, as well as intensive, ongoing study of all aspects of the global, US, state, regional, metropolitan area, and county economies. It is extensively used by scores of federal and State governmental entities on an ongoing basis, as well as hundreds of major corporations. In this instance the relevant regional sub-models (Texas and the Midland, Austin-Round Rock, Dallas-Fort Worth-Arlington, and Houston-The Woodlands-Sugar Land MSAs) were used to project the various aspects of the indices over a five-year horizon.

This section describes the forecasting process in a comprehensive manner, focusing on both the modeling and the supplemental analysis. The overall methodology, while certainly not ensuring perfect foresight, permits an enormous body of relevant information to impact the economic outlook in a systematic manner.

Model Logic and Structure

The US Multi-Regional Econometric Model revolves around a core system which projects output (real and nominal), income (real and nominal), and employment by industry in a simultaneous manner. For purposes of illustration, it is useful to initially consider the employment functions. Essentially, employment within the system is a derived demand relationship obtained from a neo-Classical production function. The expressions are augmented to include dynamic temporal adjustments to changes in relative factor input costs, output and (implicitly) productivity, and technological progress over time. Thus, the typical equation includes output, the relative real cost of labor and capital, dynamic lag structures, and a technological adjustment parameter. The functional form is logarithmic, thus preserving the theoretical consistency with the neo-Classical formulation.

The income segment of the model is divided into wage and non-wage components. The wage equations, like their employment counterparts, are individually estimated at the 3-digit North American Industry Classification System (NAICS) level of aggregation. Hence, income by place of work is measured for approximately 90 production categories. The wage equations measure real compensation, with the form of the variable structure differing between "basic" and "non-basic."

The basic industries, comprised primarily of the various components of Mining, Agriculture, and Manufacturing, are export-oriented, i.e., they bring external dollars into the area and form the core of the economy. The production of these sectors typically flows into national and international markets; hence, the labor markets are influenced by conditions in areas beyond the borders of the particular region. Thus, real (inflation-adjusted) wages in the basic industry are expressed as a function of the corresponding national rates, as well as measures of local labor market conditions (the reciprocal of the unemployment rate), dynamic adjustment parameters, and ongoing trends.

The "non-basic" sectors are somewhat different in nature, as the strength of their labor markets is linked to the health of the local export sectors. Consequently, wages in these industries are related to those in the basic segment of the economy. The relationship also includes the local labor market measures contained in the basic wage equations.

Note that compensation rates in the export or "basic" sectors provide a key element of the interaction of the regional economies with national and international market phenomena, while the "non-basic" or local industries are strongly impacted by area production levels. Given the wage and employment equations, multiplicative identities in each industry provide expressions for total compensation; these totals may then be aggregated to determine aggregate wage and salary income. Simple linkage equations are then estimated for the calculation of personal income by place of work.

The non-labor aspects of personal income are modeled at the regional level using straightforward empirical expressions relating to national performance, dynamic responses, and evolving temporal patterns. In some instances (such as dividends, rents, and others) national variables (for example, interest rates) directly enter the forecasting system. These factors have numerous other implicit linkages into the system resulting from their simultaneous interaction with other phenomena in national and international markets which are explicitly included in various expressions.

The output or gross area product expressions are also developed at the 3-digit NAICS level. Regional output for basic industries is linked to national performance in the relevant industries, local and national production in key related sectors, relative area and national labor costs in the industry, dynamic adjustment parameters, and ongoing changes in industrial interrelationships (driven by technological changes in production processes).

Output in the non-basic sectors is modeled as a function of basic production levels, output in related local support industries (if applicable), dynamic temporal adjustments, and ongoing patterns. The inter-industry linkages are obtained from the input-output (impact assessment) system which is part of the overall integrated modeling structure maintained by The Perryman Group. Note that the dominant component of the econometric system involves the simultaneous estimation and projection of output (real and nominal), income (real and nominal), and employment at a disaggregated industrial level. This process, of necessity, also produces projections of regional price deflators by industry. These values are affected by both national pricing patterns and local cost variations and permit changes in prices to impact other aspects of economic behavior. Income is converted from real to nominal terms using Texas Consumer Price Index, which fluctuates in response to national pricing patterns and unique local phenomena.

Several other components of the model are critical to the forecasting process. The demographic module includes (1) a linkage equation between wage and salary (establishment) employment and household employment, (2) a labor force participation rate function, and (3) a complete population system with endogenous migration. Given household employment, labor force participation (which is a function of economic conditions and evolving patterns of worker preferences), and the working age population, the unemployment rate and level become identities.

The population system uses Census information, fertility rates, and life tables to determine the "natural" changes in population by age group. Migration, the most difficult segment of population dynamics to track, is estimated in relation to relative regional and extra-regional economic conditions over time. Because evolving economic conditions determine migration in the system, population changes are allowed to interact simultaneously with overall economic conditions. Through this process, migration is treated as endogenous to the system, thus allowing population to vary in accordance with relative business performance (particularly employment).

Real retail sales is related to income, interest rates, dynamic adjustments, and patterns in consumer behavior on a store group basis. It is expressed on an inflation-adjusted basis. Inflation at the state level relates to national patterns, indicators of relative economic conditions, and ongoing trends. As noted earlier, prices are endogenous to the system.

A final significant segment of the forecasting system relates to real estate absorption and activity. The short-term demand for various types of property is determined by underlying economic and demographic factors, with short-term adjustments to reflect the current status of the pertinent building cycle. In some instances, this portion of the forecast requires integration with the Multi-Regional Industry-Occupation System which is maintained by The Perryman Group. This system also allows any employment simulation or forecast from the econometric model to be translated into a highly detailed occupational profile.

The overall Texas Econometric Model contains numerous additional specifications, and individual expressions are modified to reflect alternative lag structures, empirical properties of the estimates, simulation requirements, and similar phenomena. Moreover, it is updated on an ongoing basis as new data releases become available. Nonetheless, the above synopsis offers a basic understanding of the overall structure and underlying logic of the system.

Model Simulation and Multi-Regional Structure

The initial phase of the simulation process is the execution of a standard non-linear algorithm for the state system and that of each of the individual sub-areas. The external assumptions are derived from scenarios developed through national and international models and extensive analysis by The Perryman Group. The US model, which follows the basic structure outlined above, was used to some extent in the current analysis to define the demand for domestically produced goods on a per capita basis.

Once the initial simulations are completed, they are merged into a single system with additive constraints and interregional flows. Using information on minimum regional requirements, import needs, export potential, and locations, it becomes possible to balance the various forecasts into a mathematically consistent set of results. This process is, in effect, a disciplining exercise with regard to the individual regional (including metropolitan and rural) systems. By compelling equilibrium across all regions and sectors, the algorithm ensures that the patterns in state activity are reasonable in light of smaller area dynamics and, conversely,

that the regional outlooks are within plausible performance levels for the state as a whole.

The iterative simulation process has the additional property of imposing a global convergence criterion across the entire multi-regional system, with balance being achieved simultaneously on both a sectoral and a geographic basis. This approach is particularly critical on non-linear dynamic systems, as independent simulations of individual systems often yield unstable, non-convergent outcomes.

It should be noted that the underlying data for the modeling and simulation process are frequently updated and revised by the various public and private entities compiling them. Whenever those modifications to the database occur, they bring corresponding changes to the structural parameter estimates of the various systems and the solutions to the simulation and forecasting system. The multi-regional version of the US Multi-Regional Econometric Model is re-estimated and simulated with each such data release, thus providing a constantly evolving and current assessment of state and local business activity.

The Final Forecast

The process described above is followed to produce an initial set of projections. Through the comprehensive multi-regional modeling and simulation process, a systematic analysis is generated which accounts for both historical patterns in economic performance and inter-relationships and best available information on the future course of pertinent external factors. While the best available techniques and data are employed in this effort, they are not capable of directly capturing "street sense," i.e., the contemporaneous and often non-quantifiable information that can materially affect economic outcomes. In order to provide a comprehensive approach to the prediction of business conditions, it is necessary to compile and assimilate extensive material regarding current events and factors both across the state of Texas and elsewhere.

This critical aspect of the forecasting methodology includes activities such as (1) daily review of hundreds of financial and business publications and electronic information sites; (2) review of major newspapers and online news sources in the state on a daily basis; (3) dozens of hours of direct telephone interviews with key business and political leaders in all parts of the state; (4) face-to-face discussions with representatives of major industry groups; and (5) frequent site visits to the various regions of the state. The insights arising from this "fact finding" are analyzed and evaluated for their effects on the likely course of the future activity.

Another vital information resource stems from the firm's ongoing interaction with key players in the international, domestic, and state economic scenes. Such activities include visiting with corporate groups on a regular basis and being regularly involved in the policy process at all levels. The firm is also an active participant in many major corporate relocations, economic development initiatives, and regulatory proceedings.

Once organized, this information is carefully assessed and, when appropriate, independently verified. The impact on specific communities and sectors that is distinct from what is captured by the econometric system is then factored into the forecast analysis. For example, the opening or closing of a major facility, particularly in a relatively small area, can cause a sudden change in business performance that will not be accounted for by either a modeling system based on historical relationships or expected (primarily national and international) factors.

The final step in the forecasting process is the integration of this material into the results in a logical and mathematically consistent manner. In some instances, this task is accomplished through "constant adjustment factors" which augment relevant equations. In other cases, anticipated changes in industrial structure or regulatory parameters are initially simulated within the context of the Multi-Regional Impact Assessment System to estimate their ultimate effects by sector. Those findings are then factored into the simulation as constant adjustments on a distributed temporal basis. Once this scenario is formulated, the extended system is again balanced across regions and sectors through an iterative simulation algorithm analogous to that described in the preceding section.

Appendix B: Industry Employment Forecast

Projected Industry Employment Growth for Texas

Industry Sector	2019-25 Increase	Annual Growth
Agriculture	+1,788	0.36%
Mining	+29,788	1.86%
Utilities	+2,670	0.84%
Construction	+60,307	1.23%
Manufacturing	+42,978	0.79%
Wholesale and Retail Trade	+199,946	1.60%
Transportation & Warehousing	+58,021	1.81%
Information	+18,110	1.42%
Finance, Insurance & Real Estate	+67,866	1.36%
Other Services	+1,022,258	2.83%
Government	+130,076	1.00%
Total, All Industries	**+1,633,810**	**1.95%**

Source: US Multi-Regional Econometric Model, The Perryman Group

Projected Industry Employment Growth for Dallas-Fort Worth-Arlington MSA

Industry Sector	2019-25 Increase	Annual Growth
Agriculture	+149	0.44%
Mining	+2,819	1.62%
Utilities	+491	0.82%
Construction	+15,990	1.23%
Manufacturing	+15,042	0.87%
Wholesale and Retail Trade	+61,272	1.64%
Transportation & Warehousing	+24,153	1.92%
Information	+7,590	1.43%
Finance, Insurance & Real Estate	+27,690	1.43%
Other Services	+335,033	3.04%
Government	+31,191	1.10%
Total, All Industries	**+521,420**	**2.12%**

Source: US Multi-Regional Econometric Model, The Perryman Group

Projected Industry Employment Growth for Austin-Round Rock MSA

Industry Sector	2019-25 Increase	Annual Growth
Agriculture	+25	0.23%
Mining	+473	1.78%
Utilities	+112	0.82%
Construction	+4,840	1.21%
Manufacturing	+3,041	0.85%
Wholesale and Retail Trade	+17,694	1.68%
Transportation & Warehousing	+2,710	2.16%
Information	+3,351	1.72%
Finance, Insurance & Real Estate	+6,871	1.65%
Other Services	+94,664	2.82%
Government	+10,093	0.95%
Total, All Industries	**+143,873**	**2.05%**

Source: US Multi-Regional Econometric Model, The Perryman Group

Projected Industry Employment Growth for Houston-The Woodlands-Sugar Land MSA

Industry Sector	2019-25 Increase	Annual Growth
Agriculture	+89	0.33%
Mining	+11,078	1.92%
Utilities	+887	0.85%
Construction	+20,009	1.32%
Manufacturing	+12,135	0.86%
Wholesale and Retail Trade	+50,946	1.63%
Transportation & Warehousing	+13,910	1.71%
Information	+2,575	1.30%
Finance, Insurance & Real Estate	+15,223	1.43%
Other Services	+252,821	2.74%
Government	+26,308	1.03%
Total, All Industries	**+405,983**	**1.97%**

Source: US Multi-Regional Econometric Model, The Perryman Group

Projected Industry Employment Growth for Midland MSA

Industry Sector	2019-25 Increase	Annual Growth
Agriculture	+73	2.15%
Mining	+7,887	3.75%
Utilities	+50	2.34%
Construction	+1,985	4.25%
Manufacturing	+1,202	4.30%
Wholesale and Retail Trade	+5,596	4.83%
Transportation & Warehousing	+946	3.12%
Information	+195	2.71%
Finance, Insurance & Real Estate	+859	2.92%
Other Services	+11,785	5.16%
Government	+1,486	2.27%
Total, All Industries	**+32,064**	**4.18%**

Source: US Multi-Regional Econometric Model, The Perryman Group