



2023 April
**Midland &
Permian Basin
Economic
Indices**



The

Perryman Group

Effective economics, accessible analysis

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OVERVIEW

The Perryman Midland and Permian Basin Index values increased again in April. Oil prices were up for the month, boosting oil and gas activity, and therefore the regional economy.

After some extraordinarily difficult times, the supply chain situation in the United States is finally much improved. Issues associated with COVID-19 and other displacements have largely been overcome, and statistics are indicating that the worst of the supply chain problems are over barring another notable shock. Most products are regularly stocked in adequate quantities at grocery stores, pharmacies, and other outlets.

A healthier supply chain helps in the fight against inflation, taking some pressure off prices as goods become more readily available and supply and demand come into a more normal alignment. It also helps improve the efficiency and productivity of the economy as well as prospects for long-term growth. The bottom line is that supply chain issues have been an underlying cause of many economic challenges, and as the situation improves, the other problems will be easier to solve.

Texas continues to see consistent growth month after month. Job gains have been notable, and the labor force is expanding.

The Perryman Group's long-term outlook for the US, Texas, Permian Basin, and Midland economies remains positive, though business cycles are inevitable.

Selected economic indicators and April results for the Midland and Permian Basin indices are summarized in the following pages, with additional detail in the accompanying workbook.



SELECTED MIDLAND ECONOMIC INDICATORS: APRIL 2023

Indicator	2021	2022	2023	2022-23% change
Permian Basin Rig Count				
April	225	332	357	+7.66%
Average Year to Date	208	310	354	+13.88%
WTI Oil Price				
April	\$ 61.72	\$ 101.78	\$ 79.45	-21.94%
Average Year to Date	\$ 58.77	\$ 96.29	\$ 76.92	-20.11%
Henry Hub Natural Gas Price				
April	\$ 2.66	\$ 6.60	\$ 2.16	-67.27%
Average Year to Date	\$ 3.34	\$ 5.14	\$ 2.53	-50.80%
Housing Permits				
April	112	45	65	N/A
Total Year to Date	312	195	133	N/A
Average Housing Permit Value				
April	\$ 189,200	\$ 284,900	\$ 259,400	-8.95%
Average Year to Date	\$ 194,268	\$ 224,767	\$ 260,797	+16.03%
Housing Listings				
April	672	540	434	N/A
Total Year to Date	2,872	2,097	1,902	N/A
Median Housing Listing Price				
April	\$ 310,000	\$ 320,000	\$ 330,000	+3.13%
Average Year to Date	\$ 311,267	\$ 319,154	\$ 319,673	+0.16%
Airline Boardings				
March	38,381	50,591	56,120	10.93%
Total Year to Date	85,362	125,974	148,828	18.14%
Hotel Receipts				
April	\$ 7,961,360	\$ 9,852,042	\$ 11,542,471	+17.16%
Total Year to Date	\$ 28,307,991	\$ 35,490,746	\$ 45,830,701	+29.13%
Employment (Seasonally Adjusted)				
April	100,000	110,400	119,400	+8.15%
Average Year to Date	98,200	108,850	119,100	+9.42%
Unemployment Rate				
April	6.29%	3.10%	2.66%	N/A
Average Year to Date	6.90%	3.36%	2.66%	N/A
Midland Index (2021=100)				
April	94.30	112.69	114.83	N/A
Average Year to Date	90.83	109.20	114.47	N/A

Source: Baker-Hughes, Energy Information Agency, Census Bureau, Bureau of Transportation Statistics, Texas Comptroller of Public Accounts, Bureau of Labor Statistics, The Perryman Group



MIDLAND MSA

The Midland Economic Index was up slightly in April to 114.8, a gain of 0.5. The increase continued March's upward trend.

Several sectors expanded, including the Retail industry group (+2.9) as well as Energy (+1.7). However, there were declines in other segments, including the Construction sector (-30.4) and Real Estate (-4.9).

MIDLAND MSA ECONOMIC INDEX

RECENT RESULTS (2012=100)

Current Index Reading	114.8
Change from Previous Month	Up 0.5

MIDLAND MSA ECONOMIC INDEX

RESULTS BY INDUSTRY (2012=100)

Industry	March	April	Change
Energy	104.8	106.5	+1.7
Construction	208.2	177.8	-30.4
Manufacturing	147.4	147.4	+0.0
Retail	125.9	128.8	+2.9
Financial Services	207.3	207.8	+0.5
Real Estate	115.6	110.7	-4.9
Professional & Business Services	121.8	123.4	+1.6
Health Care	108.8	109.4	+0.6
Hospitality & Tourism	156.1	157.0	+0.9
Other Activity	131.5	131.3	-0.2
Midland Composite	114.3	114.8	+0.5

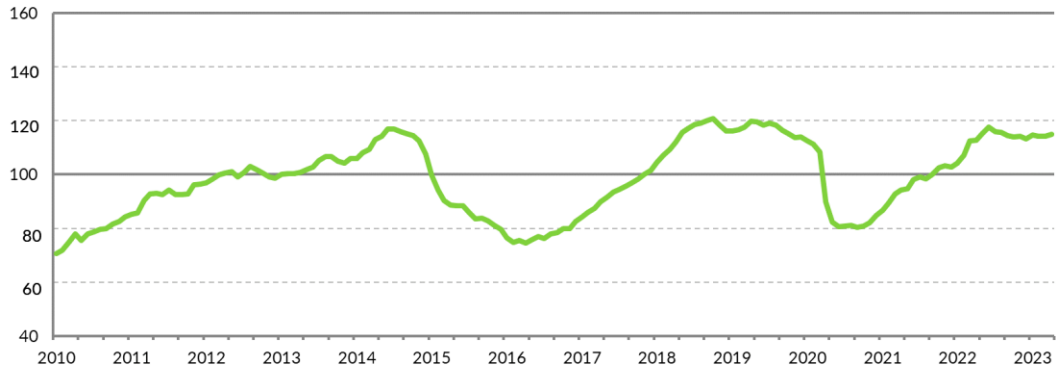
Note: Industries are not weighted equally in calculating the Industry Composite; see the Appendix for further explanation. The Midland Metropolitan Statistical Area (MSA) includes Midland and Martin counties.

Source: The Perryman Group



Midland Economic Index

(Index adjusted such that 100 represents economic status in 2012)

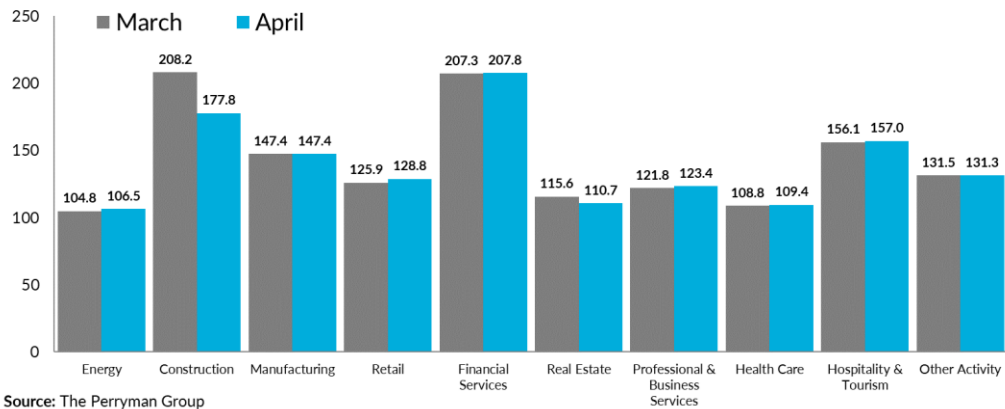


Source: The Perryman Group

Midland Economic Index

Recent values by sector

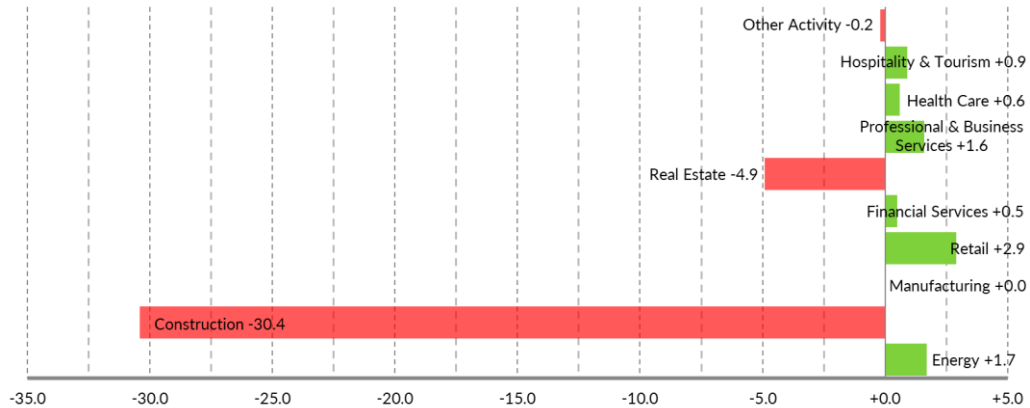
(Index adjusted such that 100 represents economic status in 2012)



Source: The Perryman Group

Midland Economic Index

Change from previous month by sector



Source: The Perryman Group



PERMIAN BASIN REGION

The Permian Basin Economic Index for April increased by 1.2 to reach 105.9.

Several sectors experienced gains during this period, including Energy (+2.7), Retail (+2.5), and Professional & Business Services (+1.3). However, both the Construction (-37.2) and Real Estate (-5.4) sectors declined.

PERMIAN BASIN ECONOMIC INDEX

RECENT RESULTS (2012=100)

Current Index Reading	105.9
Change from Previous Month	Up 1.2

PERMIAN BASIN ECONOMIC INDEX

RESULTS BY INDUSTRY (2012=100)

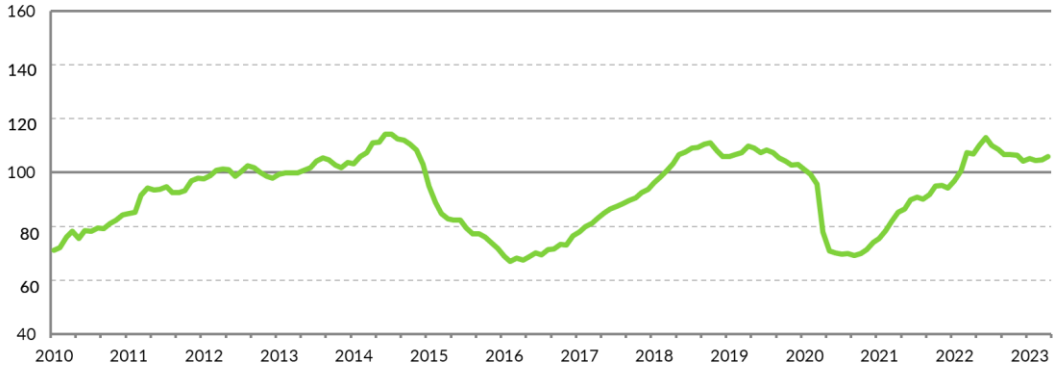
Industry	March	April	Change
Energy	96.7	99.4	+2.7
Construction	205.5	168.3	-37.2
Manufacturing	104.4	103.9	-0.5
Retail	125.5	128.0	+2.5
Financial Services	124.5	124.5	+0.0
Real Estate	124.9	119.5	-5.4
Professional & Business Services	115.7	117.0	+1.3
Health Care	105.6	105.7	+0.1
Hospitality & Tourism	145.2	145.3	+0.1
Other Activity	121.9	122.2	+0.3
Permian Basin Composite	104.7	105.9	+1.2

Note: Industries are not weighted equally in calculating the Industry Composite; see the Appendix for further explanation. The Permian Basin Region includes Andrews, Borden, Crane, Dawson, Ector, Gaines, Glasscock, Howard, Loving, Martin, Midland, Pecos, Reeves, Terrell, Upton, Ward, and Winkler counties.
Source: The Perryman Group



Permian Basin Economic Index

(Index adjusted such that 100 represents economic status in 2012)

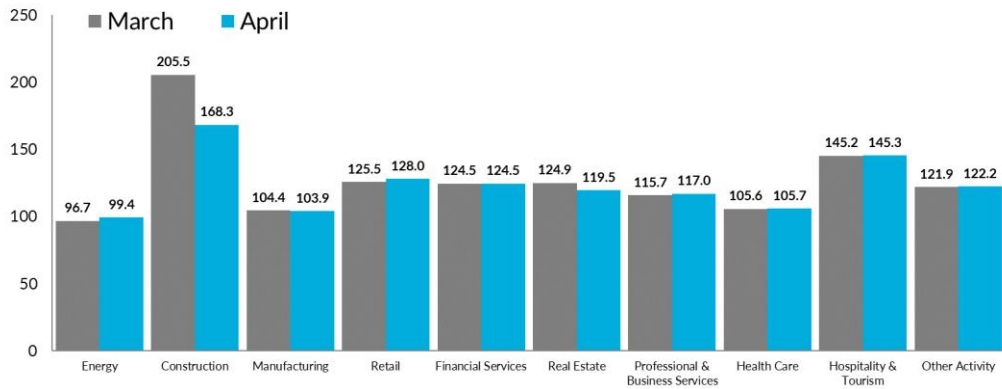


Source: The Perryman Group

Permian Basin Economic Index

Recent values by sector

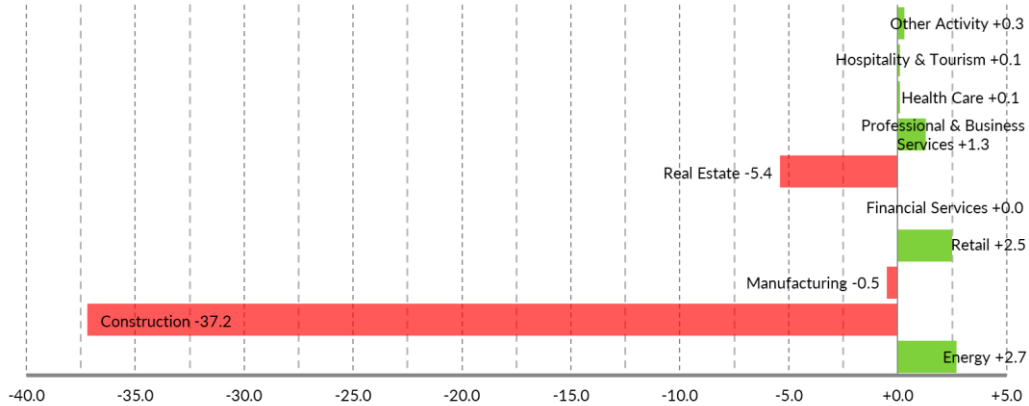
(Index adjusted such that 100 represents economic status in 2012)



Source: The Perryman Group

Permian Basin Economic Index

Change from previous month by sector



Source: The Perryman Group



METHODOLOGY

The goal of the Midland and Permian Basin indices is to encapsulate, in a single measure, the current status of the local and regional economy, how it is changing, and what is driving the change. The indices include measures of industrial performance, with sub-indices for the various components to indicate the role they play in overall performance. The indices are based on complex economic modeling processes, but it provides a simple measure of the health of the local and regional economy and how and why it is changing.

The indices reflect shifts in key industries and performance. The relative weights of each component were determined based on typical patterns in the relationships of variables to overall economic performance. The indices include variables ranging from oil prices to construction which describe the evolving status of key industries. These measures reflect analysis of numerous indicators of the level of activity and how it is changing.

The Midland and Permian Basin indices were developed and are maintained by The Perryman Group, an economic and financial analysis firm based in Waco, Texas with decades of experience in analyzing the local and regional economies. Dr. M. Ray Perryman, President and CEO of The Perryman Group, has more than 40 years of experience in index construction and regional economic modeling. In particular, Dr. Perryman derived the indices of monetary policy that are used by the Federal Reserve System and more than 60 other central banks around the world. He also developed regional and small-area indices of Industrial Production and Unit Labor Costs that are widely

used on a global basis, as well as measures of systematic risk for non-homogenous assets and the degree of trade integration among nations. Dr. Perryman has been an advisor to the US Department of Labor on the Consumer Price Index as well as numerous other governmental entities on index-related issues. He has also developed the world's largest regional econometric modeling system and has been analyzing the economy of Midland and the Permian Basin on an ongoing basis since the mid-1970s. The firm produces a quarterly index for a major financial firm in the state.

Index Construction

Economic indices are typically constructed in one of two ways, both of which are widely used and have been successfully employed by Dr. Perryman over the course of his career. One common method is to identify a set of relevant variables and then use principal component analysis (PCA) or a variation (such as a factor rotation) to assign weights to the individual components on an empirical basis. In essence, this process converts a set of variables into an equal number of new measures such that each of the new variables is (1) a linear combination of the original ones and (2) orthogonal to each of the others. The new measures also have the property of collectively containing all of the information in the original variables. When this approach is used, the first principal component (the one which explains the largest percentage of the variation) is typically used to determine the weights in the indices. This approach has advantages in that (1) weights are empirically generated based on their explanatory power and (2) it is relatively simple to implement. Its

major disadvantages are (1) in many instances, particularly where a large number of variables are being examined (as in the current analysis), spurious correlations with relatively minor factors that are unlikely to be sustained over time can occur; (2) the first principle component, despite exhibiting the largest explanatory power, often accounts for only a small amount of the total variation, thus failing to incorporate a substantial portion of the available information.

The second approach is to rely on economic data, theory, and models to develop an index of the desired phenomena. The primary difficulty with this method is the fact that it can become complex in its execution. The advantages are the ability to (1) systematically incorporate very large sets of variables without loss of underlying information, (2) develop sub-indices to provide a focus on specific index elements, and (3) incorporate specific economic content in a detailed and systematic manner.

In the present instance, the second option appeared to be more appropriate in that the process included the incorporation of a complex multi-dimensional framework which allows both individual and integrated consideration of a variety of segments that span multiple sectoral components. Nonetheless, a principal components model was originally attempted for purposes of completeness and to meet the conditions for statistical efficiency. As anticipated, the resulting assessment across a broad spectrum of variables across industries resulted in both weighting on relatively minor variables which were not stable across sub-periods and relatively little (less than 10 percent) information capture by the primary principal components.



Consequently, the Midland and Permian Basin indices were developed using a more formal and comprehensive data and modeling effort. This process is described below.

Industrial Variations

As noted, the indices seek to encapsulate, in a single measure, the many facets of the local and regional economy. Sub-indices are also generated for key industries in order to examine the various components and the role that they play in overall performance. Aggregates available on a monthly basis are incorporated into the indices in order to permit regular monitoring of changes in business activity. Broader measures (such as total expenditures and gross product by industry) which have greater information content but less frequent periodicity are used in defining the relative weights. In this manner, it is possible to enhance the comprehensiveness of the indices.

The segments of the economy that are included in the indices are:

- Energy,
- Construction (residential and non-residential),
- Manufacturing,
- Retail,
- Financial Services,
- Real Estate,
- Professional & Business Services,
- Health Care,
- Hospitality & Tourism, and
- Other Activity

The relative weights to be applied to each segment were derived based on the stabilized percentage

of each sector of a relevant overall aggregate (gross area product).

The next phase of the analysis is the construction of the various sectoral indices. Measures that were available on a monthly basis were employed and were selected based on their role in being reflective of aspects of the relevant segment. They were then tested relative to one another to assure that they were not subject to excessive multicollinearity. Once the final set was determined, each quarterly series was transformed into a common format in which 2012 was defined as equal to 100. The base year is consistent with most official economic series that are presented either as indices or on a constant-dollar basis. All monetary values were similarly expressed in constant 2012 dollars to avoid artificial growth generated by inflation. In a few instances, quarterly series were converted to monthly aggregates using a regression approach developed by Dr. Perryman that is widely utilized throughout the world.

The variables utilized in the indices include items such as oil and gas prices, rig counts, retail sales, single and multi-family housing permits and values, housing sales and values, bank loans and deposits, employment by detailed industrial category, and numerous other factors. Where appropriate, inputs were adjusted to eliminate seasonal patterns that are not reflective of underlying economic conditions.

In each of the indices, the weights assigned to the individual components are determined based on the relative standard errors of the normalized values. This approach allows greater weight to be assigned to those measures which exhibit more pronounced fluctuations to influence industry performance. These individual

sectoral indices were aggregated into an overall Composite Index using the weighting described above. Separate individual sectoral measures and Composite Index values were generated for the Midland Metropolitan Statistical Area and the Permian Basin Region. It should be noted that the monthly indices always use the latest available economic data. Because much of the information normally is subject to both short-term revisions and periodic benchmarking, historical values will often change from month to month. These variations are typically minor.

Historical Performance

Historical performance of components of the Midland and Permian Basin indices are provided in the accompanying workbook.

Conclusion

The Midland and Permian Basin indices provide a measure of changes in the economy that is easy to grasp and compare over time. Although the modeling process that went into the indices was complex, the result is a simple and straightforward assessment of the direction of patterns in business activity and the reasons for changes in overall performance.



THE PERRYMAN GROUP



The Perryman Group is a focused team of analysts who know how to address complex economic information tasks and present our findings effectively.

Our in-house professionals bring expertise in economics, finance, statistics, mathematics, real estate, valuation, systems analysis, engineering, technical communications, and marketing. Dr. Ray Perryman, President and CEO, has 40 years of experience in developing systems, analyzing complex problems, and communicating effectively. We have considerable pride in what we do. Our enthusiasm is both unbridled and contagious; every day brings a new opportunity for us to tackle a different problem or create a product or service specifically tailored to our clients.

OUR SERVICES

IMPACT ASSESSMENT

We have developed and continually maintain an extensive set of economic impact evaluation models that can be applied in a variety of contexts.

EXPERT TESTIMONY

We help clients analyze and communicate complex information in common-sense terms through comprehensive, objective analyses and clear, concise expert reports and presentations.

FORECASTING

We are at the cutting edge of econometrics and other advanced statistical methods and have provided innovative approaches for many complex applications.

SPEECHES

Dr. Perryman addresses dozens of audiences throughout the world every year, catering to a wide variety of events.

M. RAY PERRYMAN, PH.D.

Dr. Ray Perryman is President and CEO of The Perryman Group, an economic research and analysis firm based in Waco, Texas. His firm has served the needs of more than 3,000 clients, including two-thirds of the Global 25, over half of the Fortune 100, the 12 largest technology firms in the world, 12 US Cabinet Departments, the 9 largest firms in the US, the 6 largest energy companies operating in the US, and the 5 largest US banking institutions.

Dr. Perryman was named Outstanding Young Person of the World for Business and Economic Innovation in 1987, was designated Texan of the Year by the Texas Legislative Conference in 2012, received the Baylor University Distinguished Service Medal in 2013, was inducted into the Texas Leadership Hall of Fame in 2014, received the Cesar E. Chavez Conscience Builders Award in 2016 for his humanitarian efforts, the 2019 Chairman's Award for Lifetime Achievement in Economic Development from the International Economic Development Council, and the 2019 "Go Global"

Award for Economic Analysis from the International Trade Council. He dedicates a significant portion of his time to pro bono work aimed at helping to solve pressing social problems such as hunger, indigent healthcare, poverty, and child maltreatment.

