

# **Macroeconomic Activity Module**

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The Macroeconomic Activity Module (MAM) represents interactions between the U.S. economy and energy markets. The rate of growth of the economy, measured by the growth in gross domestic product (GDP), is a key determinant of growth in the demand for energy. Associated economic factors, such as interest rates and disposable income, strongly influence various elements of the supply and demand for energy. At the same time, reactions to energy markets by the aggregate economy, such as a slowdown in economic growth resulting from increasing energy prices, are also reflected in this module. A detailed description of the MAM is provided in the EIA publication, Model Documentation Report: Macroeconomic Activity Module (MAM) of the National Energy Modeling System, DOE/EIA-M065(2011), (Washington, DC, June 2011).

## Key assumptions

The output of the U.S. economy, measured by GDP, is expected to increase by 2.5 percent per year between 2010 and 2035 in the Reference case. Two key factors help explain the growth in GDP: the growth rate of nonfarm employment and the rate of productivity change associated with employment. As Table 2.1 indicates, in the Reference case, real GDP grows by 2.5 percent for the next ten years and by 2.6 percent for the final fifteen years of the projection. Both the high and low macroeconomic growth cases show roughly 0.5 percentage point differences in growth as compared to the Reference case. Non-farm employment shows higher growth in the first five years of the projection period and then returns to its long-run trend growth. In the Reference case, nonfarm employment grows by 1.0 percent from 2010 to 2035 as compared to 1.2 percent and 0.8 percent in the High Growth and Low Growth cases, respectively. In the Reference case, productivity (measured as output per hour in nonfarm businesses) grows by 1.9 percent from 2010 to 2035, showing slower growth than the 2.0-percent growth experienced during the previous 30 years. Business fixed investment as a share of nominal GDP is expected to grow over the last 10 years of the projection. The resulting growth in the capital stock and the technology base of that capital stock helps to sustain productivity growth of 1.9 percent from 2010 to 2035.

The Census Bureau's middle series population projection is used as a basis for population growth in the AEO2012. Total population is expected to grow by 0.9 percent per year between 2010 and 2035, and the share of population over 65 is expected to increase over time. However, the share of the labor force in the population over 65 is also projected to increase in the projection period.

To achieve the Reference case's long-run 2.5 percent economic growth, there is an anticipated steady growth in labor productivity. The improvement in labor productivity reflects the positive effects of a growing capital stock as well as technological change over time. Nonfarm labor productivity is expected to remain between 1.7 and 2.2 percent for the remainder of the projection period from 2015 through 2035.

**Table 2.1. Growth in gross domestic product, nonfarm employment and productivity**

Assumptions	2010-2015	2015-2020	2020-2035	2010-2035
<b>Real GDP (Billion Chain-Weighted \$2005)</b>				
High Growth	3.1%	2.9%	2.9%	3.0%
Reference	2.5%	2.5%	2.6%	2.5%
Low Growth	1.9%	1.8%	2.1%	2.0%
<b>Nonfarm Employment</b>				
High Growth	1.9%	1.1%	0.9%	1.2%
Reference	1.4%	1.1%	0.8%	1.0%
Low Growth	1.3%	0.9%	0.6%	0.8%
<b>Productivity</b>				
High Growth	1.4%	2.0%	2.4%	2.1%
Reference	1.1%	1.7%	2.2%	1.9%
Low Growth	0.8%	1.2%	1.7%	1.4%

Source: U.S. Energy Information Administration, AEO2012 National Energy Modeling system runs: AEO2012.d020112C, LM2012.d022412A, and HM2012.d022412A.

To reflect uncertainty in the projection of U.S. economic growth, the *AEO2012* uses High and Low Economic Growth cases to project the possible impacts of alternative economic growth assumptions on energy markets. The High Economic Growth case incorporates higher population, labor force and productivity growth rates than the Reference case. Due to the higher productivity gains, inflation and interest rates are lower as compared to the Reference case. Investment, disposable income and industrial production are greater. Economic output is projected to increase by 3.0 percent per year between 2010 and 2035. The Low Economic Growth case assumes lower population, labor force, and productivity gains, with resulting higher prices and interest rates and lower industrial output growth. In the Low Economic Growth case, economic output is expected to increase by 2.0 percent per year over the projection horizon.