CHAPTER 2: METHODOLOGY

Introduction:

This chapter explains the methodology used to create the economic and demographic forecast for the Town, which forms the basis of the housing demand portion of the housing market study and future needs assessment. The forecast model is composed of an integrated macroeconomic forecast for the U.S. economy, and another integrated macro forecast specific to the Glens Falls Metropolitan Statistical Area (the "MSA")[1] region, both purchased from Moody's Analytics.[2]

The undertaking of this housing study for Queensbury comes within a global and national context of solid economic expansion. The national economy continues to expand at a solid pace; making this a nearly nine-year sustained economic expansion which is the second longest in U.S. history. Job gains have remained solid, even as the economy is at full employment. The unemployment rate has fallen to below 4 percent, the lowest in several decades. From a business cycle perspective, the length of this expansionary period has entered rarefied and risky territory. While there is no limit on how long economic expansions will last, only one in recorded U.S. economic history has lasted longer, without recessionary or corrective periods in between. As noted earlier, the near-term outlook is for continued but slowing economic expansion.

As of right now, the historically low unemployment rate is being driven by a combination of socio-demographic trends and a massive fiscal stimulus by way of temporary deficit-financed tax cuts and increased federal government spending. The current presidential administration, with its pledges to change the previous trajectory of the nation's economic and foreign policies, represents a deliberate departure from those federal policies which characterized the previous eight years. —Because the underlying, long-term economic and demographic forecast for the Town is a foundational part of this housing market and needs assessment/study, the EPR-Crane Associates Team devoted ~~a~~ significant extra attention to the long-term economic and demographic forecast, meant to ensure that the results of this study will be reasonable and useful for the town's stakeholders into the future.

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[1] The U.S. Office of Management and Budget (OMB) delineates metropolitan statistical areas according to standards applied to Census Bureau data. The general concept of a metropolitan statistical area ("MSA") is that of a core area containing a substantial population nucleus, together with adjacent communities having a high degree of economic and social integration with that core. Each metropolitan statistical area must have at least one urbanized area or central county with a population of 50,000 or more inhabitants. Glens Falls MSA consists of (1) Warren County ("central county") and (2) adjoining county of Washington County; and its principal city of Glens Falls.

[2] Economic & Policy Resources, Inc. ("EPR") of the EPR-Crane Associates Team has been a regular subscriber to Moody's Analytics economic analysis and forecasting services for over thirty years through its various associations, such as with the New England Economic Partnership (known throughout the New England region as "NEEP"), and through its more than 35 years of experience in applied economics throughout the U.S. and in three U.S. territories. In addition, EPR has used U.S. macro and regional forecasting economic and demographic services from Moody's Analytics (or its forerunner companies) through the years for specific research projects—including several housing and demand studies throughout the northeastern United States.

Components and Methodology

Following this detailed review and analysis by EPR, the EPR-Crane Associates Team made the decision to utilize the Moody's Analytics May-June 2018 U.S. macroeconomic forecast as the basis for the Town's short-term and longer-term demographic economic forecast through calendar year 2027. This U.S. forecast, along with estimates of the Town's annual, mid-year population and net migration from the U.S. Census Bureau, laid the groundwork for the short-term and long-term forecast of Town economic activity and the resulting Town demographic forecast. This approach was determined by the EPR-Crane Associates Team to be the most credible approach employed in light of the advanced age of the current national, state, and regional economic expansion, and the growing level of uncertainty in play beyond the median term (3-5 years).

In addition, Moody's Analytics also had a sound approach for incorporating recent global events into the U.S. economic outlook. For example, Moody's Analytics thoroughly researched the risks associated with the imposition of U.S. tariffs on Chinese goods. The Moody's Analytics U.S. forecast also fully considers and incorporates the expected impacts on the U.S. resulting from the economic instability among many of the countries in the less developed world, and the growing economic imbalances in China, which is the second largest economy in the world and the primary economic and trade partner/rival of the U.S. Moody's has also incorporated economic and political developments in key regions such as the Middle East (e.g. their impacts on U.S. energy prices) and the rapidly evolving economies in Asia (in addition to developments in China). All of these extremely complex and evolving external forces require a sound and integrated, forward-looking macroeconomic and demographic foundation on which to build the economic outlook for the Town's long-term economic and demographic forecast, if the forecast is to remain relevant and useful to town stakeholders through calendar year 2027. Based on the EPR-Crane Associates Team's research and review, it was decided to use the May-June 2018 Moody's Analytics U.S. Macroeconomic forecast as the starting point of the Town economic and demographic forecast. Part of this selection process included the knowledge that the May-June 2018 macroeconomic forecast was the first forecast that attempted to fully incorporate the current and expected economic implications of the current federal trade, taxation, and fiscal policy regime.

The Moody's Analytics forecasts used in this study also were selected given the Crane Associates/EPR consulting team's successful experience in utilizing the Moody's Analytics national and regional economic forecast as a starting point for analysis and customization in several past housing supply and demand studies we've conducted throughout the northeastern U.S. region. Each time the Moody's Analytics macroeconomic forecast was used, it was found that the long-term economic and demographic forecasts were proven as critically important to the initial analytical and technical foundation for the regional economic and demographic forecast used in each previous study. One such assignment was completed during the very uncertain economic times just after the turn of the century and just as the 2005-07 housing market bubble was forming-deflating. We expect that the selection of the May-June 2018 Moody's Analytics U.S. macroeconomic forecast and the associated regional macroeconomic forecast for the Town will again prove to be a sound analytical and technical decision that will continue to build upon the

successful track record of Moody's Analytics in developing reasonable, long-term national and regional economic forecasts to be used in housing demand and supply studies of this type.

Overview of the Moody's May-June 2018 Forecast for the U.S. Economy: The Moody's Analytics May-June 2018 macro forecast (hereafter the "Moody's Forecast") serves as the basis for the regional baseline economic and demographic forecast for the town that was calculated in May-June 2018 from Moody's Analytics as the starting point for this Town housing study. The Moody's regional economic and demographic forecast for Queensbury is a step-down forecast procedure based on a separate forecast from the Glens Falls Metropolitan Statistical Area ("MSA") which covers the Warren and Washington County region. The regional economic and demographic forecast utilizes the national forecast as a basis for the forecasted variables. Because the Moody's Analytics U.S. Macro Model is a closed system, the independently-forecasted variables for the region are part of a system where all regional forecasts are forced to accumulate to the national total as determined by the U.S. Macro Model. As such, although the regional and town forecasts are developed independently based on their identified quantitative relationships to the U.S. economy, the sum of all of the independent regional forecasts are also influenced by the results of the U.S. forecast and the sum of all of the regions do not exceed the forecasted variables of the U.S. as a whole.

As mentioned above, the Moody's Forecast incorporates the most recent trade, fiscal, and monetary policy changes under the current administration and their initial and projected impacts. These included the tax legislative overhaul for individuals and business recently passed, the ongoing international trade negotiations and tariff-related brinksmanship between the U.S. and its trading partners, current labor market dynamics concerning wage growth and extraordinarily low unemployment, and tightening monetary policy moves by the Federal Reserve, all of which have far-reaching national and regional implications which will underlie the economic trajectory for the conceivable future. The Moody's Forecast accommodates these policy shifts by employing a series of assumptions of how these broad policy shifts will reverberate throughout the national economy as well as the regional economy of the MSA.

More specifically, the May-June Moody's Forecast incorporates the positive growth trajectory the economy has enjoyed for the past several months, but predicts that the labor market currently does not contain the "slack," or number of workers labeled "underemployed,"[3] that are necessary to fill all of the open jobs. Moody's predicts that this will become a primary weakness in the near future, suppressing economic activity to some extent, as labor markets tighten further, wages and inflation increase, and business become more unable to fill an increasing number of job openings at higher wages.

The Moody's Forecast includes the caution that the full-employment status of the U.S. economy currently would eventually limit the positive macroeconomic effects of the administration's policy-induced economic stimulus during the forecast period. This was because the magnitude of the tax cuts and government expenditure multipliers generate a smaller effect on job and income growth when economic

[3] Underemployed includes the unemployed, part-timers who want more hours, and those not looking for work and thus are not counted as unemployed but who say they would take a suitable job.

activity is near or at the full capacity. With little or no idle land, labor, or capital available to take advantage of those stimuli in the short term, less growth occurs than would otherwise be expected at a given level of stimulus. Conversely, the stimulative impact on the economy associated with the administration's actions would likely have a greater impact were the U.S. economy now experiencing economic conditions like those during the "Great Recession" of 2009, when unemployment and large amounts of unused industrial and business capacity were present. However, the current conditions within the U.S. economy are markedly different than in 2009, when economic recovery legislation was passed as the U.S. and regional economies were emerging from the last recession. Instead, it is noteworthy that the positive effects of expansionary, or deficit spending, fiscal policy is often crowded out by off-setting actions associated with a less accommodative Federal Reserve and the actions of global investors, who have a demonstrated tendency to act to push up long-term interest rates in anticipation of higher inflation and larger federal budget deficits when the economy is operating close to "full capacity.".

In the Moody's Forecast, higher inflation rates and higher interest rates are built-in—including core[4] consumer price inflation pushing through the two to two-and-half percent level on a sustained basis. A persistent two-and-half percent rate of core inflation would be well above the Federal Reserve's rumored inflation target. During periods when the inflation rate exceeds the target of the Federal Reserve, the Federal Reserve often responds by increasing short–term interest rates—the federal funds rate. The Moody's Forecast expects the federal funds rate to increase to over three and one half percent by early 2020, and the long-term, 10-year Treasury yield to reach as high as four percent. Moody's Analytics notes in its May-June 2018 macroeconomic forecast that this is a "classic symptom" of an overheating U.S. economy, which has historically ended in an economic recession or downturn.

Beyond the initial four years to five years of the forecast time frame, the Moody's Forecast does not expect the Administration's actions to materially alter the long-run growth potential of the U.S. or MSA regional economy. Moody's Analytics expects the long-run growth potential of the U.S. economy as measured by real U.S. GDP[5]—the output growth potential that is consistent with stable unemployment—to remain the same . In effect, Moody's Analytics expects that the policy proposals of the new administration will not alter the two percent per annum long-term growth potential of the U.S. economy. Moody's Analytics notes in the May-June 2018 forecast that the corporate tax reform should provide a meaningful boost to the economy's growth potential. The lower marginal rates and the adoption of a territorial tax system will likely lower the cost of capital for many U.S. businesses and, as a result, encourage increased capital investment activity. Moody's Analytics also notes that more investment and a larger capital stock, in turn, will act to lift labor productivity growth and the U.S. economy's growth potential.

However, the Moody's Forecast also includes the expectation that the positive effect on the U.S. and regional economy's growth potential will require time to develop, and this "development" time frame is assumed under the Moody's Forecast to extend beyond the current administration. While the administration's policy initiatives could meaningfully add to the U.S. economy's growth potential during

[4] That is the inflation rate excluding volatile food and energy prices.
[5] GDP means Gross Domestic Product.

the near term, these initiatives are not expected to be "game changers." While the initial period under this policy regime has shown a boost to economic activity, there are significant barriers to long-term sustained annual GDP growth of 4.0%. As a result, the Moody's Forecast predicts a possible correction, or the downward portion of the current business cycle, to be apparent by the Summer of 2020.

Among the primary indicators which Moody's cites to back up this prediction are the natural rate of unemployment and the inversion of the yield curve. While the specific number associated with the "natural" unemployment rate can be debated due to its very complex interplay of determinants, Moody's reports that its estimate at 4.5% mirrors most alternative estimates by analysts. This unemployment rate was achieved during the summer of 2017, and the indicator has continued to decline since, reaching 3.7% during September 2018. Drawing on historical evidence that, on average, recessions have occurred approximately three years after the economy has moved beyond full employment, leads Moody's forecasters to their assumption of a recession in Summer of 2020. Similarly, an inverted yield curve is also a leading indicator of a recession. Citing the so-called "policy yield curve," Moody's measures the difference between the 10-year Treasury bond yield and the federal funds rate. If the curve inverts in the later stages of a business cycle, it shows that investors are anticipating lower yields from long-term bonds from a sluggish economy. Moody's predicts an inversion to the yield curve occurring in summer 2019, and citing the historical length of time between the inversion of the yield curve and the next recession, averaging one year, this again leads Moody's to assume a Summer 2020 recession in its forecasting.

The Moody's Forecast does not expect that the net effect of these policy changes, when implemented and integrated into the U.S. economy's supply side, will achieve the administration's stated objective of sustained four percent annual growth rates for the U.S. economy over the long term. Moody's predicts that the stimulative effect of tax reform or other government spending and investment may to a large degree be off-set by trade goals currently under pursuit. Those trade agreement re-negotiations and tariff impositions may hamper the U.S. economy's future performance by leading to higher prices for commodities and intermediate goods. Such policy changes could be expected to impede competition and productivity growth over the longer term in the U.S. economy. Overall, these negative and positive policy shifts within the U.S. economy are expected to result in little net change over the longer term due to the expected cross-cutting policy changes. .

Forecast Model Details:

Since the Moody's Analytics U.S. Macroeconomic Model is a foundational part of this study, this section is intended to describe this sophisticated tool and to provide the reader with a road map to the model's construction. The Moody's Analytics U.S. Macroeconomic Model (hereafter the "Moody's U.S. Macro Model") is a large scale, multi-equation structural econometric model of the U.S. economy that is designed to produce a conjoined short-term and long-term forecast of the U.S. economy. The model includes more than 1,800 published and unpublished intermediate variables that split the difference between the theoretical "short" and "long" term time boundaries, defined by a family of quantitative models which employ pure time series methods. The analytical priority is to obtain the purest "statistical fit" for the time series data while employing few, if any, assumptions about empirical or theoretical underpinning of how

the economy operates. This is combined with a family of quantitative models which are used to forecast the economy by heavily relying on theoretical applications of microeconomic theory, based on a carefully crafted set of theory-based assumptions, which is alternative to the first technical approach. The U.S. macroeconomic and accompanying regional forecasting models maintained by Moody's Analytics reflect a blending of the two types of model theory presented above. The Moody's U.S. Macro Model relies on the approach of "specifying, estimating, and then solving simultaneously" a large set of empirically-based equations that are intended to "mirror the structural workings" and inter-relationships of the U.S. economy.

The theory behind the Moody's U.S. Macro Model can be summarized as an intersection of the U.S. economy's aggregate demand and aggregate supply. Over the shorter term time horizon, the Moody's U.S. Macro Model assumes that "ups and downs" in economic activity are a function of changes in aggregate demand. This assumes that aggregate supply—or the growth potential of the U.S. economy—remains "unchanged" during that theoretical "short-term" time horizon, or in other words, the level of resources and technology that are available for output growth do not change. Over the longer term, Moody's U.S. Macro Model does incorporate changes in supply into the economy's growth potential. By incorporating the supply side changes, such as expansions in labor and capital and changes in technology which allow the economy's inputs to be transformed into higher levels of output at higher levels of efficiency, the longer-term Moody's Analytics macroeconomic forecast therefore reflects the Moody's U.S. Macro Model interaction between aggregate supply and aggregate demand. According to Moody's Analytics, this interaction is captured mathematically in the relationship between three key macroeconomic variables for the U.S. economy. These include:

- GDP depends on aggregate spending, which in turn depends on the expected real rate of interest, or the nominal rate less future inflation;
- Nominal interest rates are determined both by monetary policy and by private demand for credit, both of which are influenced by GDP;
- Inflation is determined by firm price-setting choices, which depend on the level of real activity and inflation expectations.

In its technical documentation of the Moody's U.S. Macro Model,[6] Moody's Analytics points out that the above mathematically describes a system of three equations that can be solved for the three unknowns—real or inflation-adjusted GDP, nominal-dollar interest rates, and inflation—conditional on given expectations of future income and inflation for the U.S. economy. Drs. Zandi and Hoyt further elaborate that the classical long-run equilibrium for the economy is achieved at the point where expectations are consistent with reality. When this occurs in the economy, the level of real output, interest rates and inflation remain stable at equilibrium values governed entirely by the supply side of the economy. However, they

[6] See U.S. Macro Model Methodology, April 2015; Dr. Mark Zandi and Dr. Scott Hoyt, Moody's Analytics; Economic & Consumer Credit Analytics, pp. 1-15. The description herein draws heavily from the above model documentation which was published as part of Moody's Analytics' work regarding "stress-testing" analyses for U.S. financial institutions. The technical information regarding the Moody's U.S. Macro Model's theoretical construction is also useful for understanding why and how this tool was employed in this housing study for the town.

note that in the short run, a shock to any part of this system can cause spending and inflation to depart from expectations. If that occurs; it causes departures in current growth, interest, and inflation rates from their long-run equilibrium values, giving rise to business cycles—the recurring ups and downs in economic activity that have characterized the U.S. economy that have been documented by the National Bureau of Economic Research ("NBER") since the middle of the 1800s.

Within the context of the above, the Moody's U.S. Macro Model includes a system of equations covering all aspects of the U.S. economy typically expected in classical macroeconomic theory. Aggregate demand in the Moody's U.S. Macro Model is disaggregated into consumption, business investment, international trade, and government expenditures. The key categories of macro activity included in the model include: (1) consumer spending, (2) gross private domestic investment, (3) international trade, (4) government spending and fiscal policy, (5) aggregate supply, (6) inflation, (8) monetary policy and financial markets, (9) personal income and corporate profits, (10) labor markets, and (11) housing. The Moody's U.S. Macro Model also includes break outs of key variables in the consumer sector, components of personal income, and output-jobs by industry. The detail for each of the eleven activity areas is summarized below.

Consumer Spending: Consumer spending is a key part of the economy and is disaggregated into spending on motor vehicles and parts, durable goods excluding motor vehicles, nondurable goods, and services as the key components of spending. Within the Moody's U.S. Macro Model, each of these consumption components is modeled on a per capita basis to account for population growth. These categories are modeled as a function of real or inflation-adjusted income and real or inflation-adjusted household net worth. Energy prices, as they impact the consumption of vehicles, nondurable goods and services are also factored in to the consumer spending's system of equations. The Moody's U.S. Macro Model treats vehicle spending as an intermediate step—since it is a key part of consumer spending as a durable or "big-ticket" good. Factors particular to the automobile market also have a significant influence on automobile purchases, so Moody's treats them separately within the broader framework of consumer durable purchases. The components of durable goods excluding motor vehicles, nondurable goods and services are modeled separately but forced to sum to the appropriate aggregate expenditure category. Other variables including unemployment, consumer sentiment, demographic trends, home sales, and the price of the particular good or service relative to the prices of all consumer goods and services are included in the models that support this macro activity area of the Moody's U.S. Macro Model.

Gross Private Domestic Investment: Gross private domestic investment is divided in the Moody's U.S. Macro Model into three different categories: residential construction, fixed business investment, and inventory investment. Each category of investment is determined by different factors which reflect their differing cyclical patterns and macroeconomic basis. Estimates of residential construction activity are impacted by household formation growth and housing affordability. Housing affordability, in turn, is determined by mortgage rates, house prices, and income growth; tax law changes; consumer sentiment; and lending standards established by mortgage lenders. Measures of residential construction activity included in the Moody's U.S. Macro Model include single- and multifamily housing starts, existing-home

sales, and several measures of house prices—including the FHFA-HPI[7]. The FHFA HPI is thought to be a good proxy for housing prices because it includes all sale and re-financing transactions within a geographic area where an appraisal is used to establish housing value or price. The FHFA HPI excludes house transactions involving "jumbo" mortgages.[8]

Fixed business investment in the Moody's U.S. Macro Model is divided into four categories of equipment and software, three categories of intellectual property, and five categories of nonresidential structures. Moody's Analytics explains that business investment plays an important role in both the demand and supply sides of the economy. On the demand side, investment is a critical determinant of the business cycle because it responds to, and therefore amplifies, shifts in output. In the traditional accelerator/multiplier theory, the level of investment depends on the change in expected output; investment changes will in turn stimulate further movements in output through the multiplier effects. Investment influences the supply side of the economy since it is the principal determinant of potential output and labor productivity. Investment spending, under the Moody's U.S. Macro Model construct, adds to both the stock of capital available per worker and also determines the extent to which the capital stock embodies the latest and most efficient technology. The Moody's U.S. Macro Model specification of the investment equations is based on the neoclassical investment theory of individual firms. Following this approach, net investment is modeled as a function of changes in expected output and the cost of capital. The cost of capital is equal to the implicit cost of leasing a capital asset—per economic theory.

Although most theoretical analyses assume that businesses do not face constraints on investment funds, in practice there are limits to the availability of credit. Corporate cash flow and debt levels are therefore also important determinants in the investment equations in the Moody's U.S. Macro Model. Investment in intellectual property is dependent on technology spending and profits. Investment in different types of nonresidential structures is driven in the Moody's U.S. Macro Model by construction put in place, which is in turn determined by measures that proxy for absorption of space, vacancy rates, and government spending. Investment in mining structures is closely linked to changes in oil prices. Inventory investment is divided into farm and nonfarm inventories. Nonfarm inventory change is further divided into construction and mining, manufacturing, and wholesale and retail inventories. Inventory investment is dependent on final sales and production which is "proxied" by capacity utilization—a commonly reported level of asset utilization by industry category.

International Trade: World trade has been growing rapidly and has become more important to the U.S. economy in recent decades. This trend is expected to continue, despite the campaign rhetoric attributable to representatives of the new administration. The Moody's U.S. Macro Model includes an international trade sector that captures the interactions between foreign and domestic prices, interest rates, exchange rates, and estimated product flows. Within the model, export prices and volumes are determined by what

[7] FHFA refers to Federal Housing Finance Agency Housing Price Index.

[8] A jumbo mortgage is a house loan for an amount that exceeds conforming loan limits established by regulation. The jumbo loan limit is $417,000 in most regions of the United States. The limit on jumbo loans is $625,500 in the nation's highest-priced areas.

are called stochastic equations, while nominal trade flows are calculated as identities. Merchandise trade flows are disaggregated between goods and services with imports of automobiles and parts also modeled separately within the Moody's U.S. Macro Model.

The key determinants of export volumes are global GDP growth and both the real and nominal trade-weighted value of the U.S. dollar. The structural equations in the Moody's U.S. Macro Model for imports allow a richer specification than do the corresponding export equations. Real imports are determined by specific domestic spending categories and relative prices. Projections of international economic activity are determined using the Moody's Analytics international economic model system and are provided exogenously[9] to the Moody's U.S. Macro Model and regional economic model system.

Government Spending and Fiscal Policy: Federal government spending and fiscal policies are treated in the Moody's U.S. Macro Model as partially exogenous to the U.S. economy, since legislative and administrative decisions are not tied with enough predictability to changes in macroeconomic conditions. At its most basic macroeconomic level, federal government spending is the sum of federal consumption and investment expenditures. These two expenditure categories are, in turn, divided into defense and nondefense categories. Federal defense and nondefense expenditures are each the sum of compensation and non-compensation federal purchases. Total federal government outlays in the Moody's U.S. Macro Model include the sum of defense and nondefense consumption expenditures plus transfer payments, net interest payments, subsidies less current surplus of government enterprises, federal grants-in-aid to state and local governments, less wage accruals net of disbursements. All outlays are exogenous except for transfer payments, which are a function of unemployment insurance payments, net interest payments (which are a function of interest rates and the publicly held Treasury debt), and government consumption (which is included in the Moody's U.S. Macro Model as a component of GDP and assumed to grow in a trend-like manner). Total federal government receipts are the sum of personal tax receipts, social insurance contributions, corporate profits tax receipts, and indirect tax receipts. Personal taxes account for the bulk of federal tax collections—accounting for nearly one-half of total receipts. Personal tax receipts are equal to the product of the average effective income tax rate times the tax base. The tax base is defined as personal income less nontaxable components of income (which include other labor income and government transfers). Most average effective tax rates are exogenous and actually comprise key policy levers in the model. The personal income tax rate is modeled based on high, low and middle marginal tax rate and changes in real stock and home prices. This allows for more policy levers in the Moody's U.S. Macro Model and account for capital gains tax receipts.

The federal budget deficit is measured both on a National Income and Product Accounts (or "NIPA") basis and on a unified basis. Differences between the two measures depend on accounting methods, coverage, and timing. For example, the unified budget counts receipts on a cash collections basis; the NIPA records

[9] The term "exogenous" means that this variable is estimated using quantitative tools other than the U.S. Macro Model. Separate values are inputted into the Moody's U.S. Macro Model that have been determined elsewhere (e.g. through other models) that are not run jointly with the Moody's U.S. Macro Model and are therefore outside or "exogenous" to the model.

corporate profit receipts on a liability basis (as is done in the so-called GDP accounts), and personal income taxes and Social Security payments on a "when paid" basis. Thus, unified outlays are counted when funds are disbursed. In contrast, NIPA outlays are recorded at the time of delivery. The state and local government sector of the Moody's U.S. Macro Model is modeled similarly to the federal sector. Revenues are a function of exogenous average effective tax rates and their corresponding national income categories, plus federal grants-in-aid. Expenditures for all but net interest costs are exogenously determined. Government spending in the NIPA calculations of GDP includes government consumption and adds government investment spending. Other components are considered transfers rather than economic output. One unique feature of the government sector of the NIPA accounts is that, unlike most modeling of expenditures, government spending is forecast in nominal terms, with price deflators for each category of expenditures forecasted as well. Real values are then derived as identities within the Moody's U.S. Macro Model.

Aggregate Supply: The supply side of the Moody's U.S. Macro Model describes the U.S. economy's capabilities for producing output. By extension, the Glens Falls MSA regional economic model, which provided the baseline economic and demographic forecast for this study, describes the same capacity for producing output for the MSA. In the Moody's U.S. Macro model, aggregate supply or potential GDP is estimated by a Cobb-Douglas production function that combines factor input growth and improvements in productivity (e.g. through advances in technology that improve output efficiency). Factor inputs include labor and business fixed capital, and are defined by an estimate of the full-employment labor force and by the existing capital stock of private nonresidential equipment and structures. Population is estimated based on Census Bureau birth and death rates and immigration rates that are determined by the economic performance of the United States relative to the rest of the world. The baseline population forecast for the MSA was determined in a similar way, except the relative performance is for the MSA relative to the closed system for the U.S. economy—with the MSA's forecast part of an algorithm where the totals for the parts (e.g. all regional forecasts) are relationally forced to sum to the national total. Total factor productivity is calculated as the residual from the Cobb-Douglas production function estimated at full employment. A key unknown in estimating aggregate supply is what the full employment level of labor actually is. This level is derived from a measure of potential labor supply and a measure of the long-run equilibrium unemployment rate for the U.S. economy. This rate, often referred to as NAIRU or the **N**on-**A**ccelerating **I**nflation **R**ate of **U**nemployment, is the unemployment rate consistent with steady price (and wage) inflation. It is also the unemployment rate at which actual GDP equals potential GDP.

Estimation of the NAIRU proceeds with the estimation of an expectations augmented Phillips curve relationship between inflation and unemployment. The inflation measure used is the chain price index for personal consumption expenditures excluding food and energy. The NAIRU estimated in this Phillips curve is the "married male" NAIRU. This group is chosen for the Moody's U.S. Macro Model because "married males" are expected to have the greatest attachment to the labor market, and thus be less susceptible to changes in labor force participation than other groups that may be affected more by changing demographic composition, changed work habits, or reduced discrimination (which are typical possible factors that drive labor force participation). This stability allows the Moody's U.S. Macro Model to more

accurately estimate a married male (MM) NAIRU that is constant over time. Married female and unmarried NAIRUs are derived via statistical techniques such as regression from the married male NAIRU. These individual NAIRUs are demographically weighted to arrive at an overall NAIRU.

The growth of aggregate supply in the Moody's U.S. macro Model is the fundamental constraint on the long-term growth of aggregate demand. When actual GDP is above or below potential GDP, there is an output gap. Given currently high unemployment relative to NAIRU, the current output gap is large. Inflation created by demand that approaches or surpasses potential GDP (a positive output gap) raises credit costs and weakens consumer confidence, thus constraining aggregate demand when the economy is overheating. Conversely, lower inflation and easier credit stimulate demand when economic conditions are slack. Thus, output and employment gaps form the key determinants of prices in the Moody's U.S. Macro Model, as price movements become the mechanism for restoring the full-employment level of output. An increase in government spending, for example, narrows the output gap, driving up output prices and lowering the unemployment rate. Higher prices and a tighter labor market, in turn, tend to force up wage rates, further putting upward pressures on prices- inflation, although this effect is partially offset by an increase in labor productivity. Higher inflation and a stronger real economy drive up interest rates and reduce real income gains. The net effect is a dampening of aggregate demand to bring it back in line with aggregate supply over the long-term.

Inflation: Decisions about prices are made by individual firms. Firms adjust their prices in response to conditions in their markets. If demand has been strong and they are producing more than they think is appropriate given their current prices, they will raise their prices. If demand has been weak and the firms are producing less than appropriate, they will lower their prices. When the Moody's U.S. Macro Model handles this process in terms of aggregate variables—GDP and the price level—prices will tend to rise whenever GDP has been above potential and will tend to fall when it has been below potential. Firms make their price decisions with the prices of their inputs in mind. The most important input is labor. Therefore, the behavior of the wage rate is a major determinant of the price adjustment process. Wages and demand pressures on prices determine a relationship between the deviation of GDP from potential and inflation. This is embodied in the wage equations of the Moody's U.S. Macro Model through an expectations augmented Phillips curve, where wages react to expected inflation and unemployment. The fundamental wage equation in the model is the wage component of the Bureau of Labor Statistics' quarterly "Productivity & Costs" release. The explanatory variables include the difference between the actual unemployment rate and the NAIRU, private nonfarm labor productivity growth, and consumer prices. Within the Moody's U.S. Macro Model, the impact of prices takes three years to fully play out in the model. In addition to labor, energy is another important determinant of business costs.

In the specification of the Moody's U.S. Macro Model, firms are expected to be quicker to pass through energy price increases to consumers on goods that are especially sensitive to oil prices such as gasoline and agricultural commodities. Firms also pass through price increases on services such as airfare, train fare and wholesale trade after material and persistent rises in their energy costs. Electricity and natural gas consumer prices are slower to rise, since utilities must seek the permission of policymakers in order to raise

prices in the regulated utilities industry. Energy is an input cost to virtually every firm in every industry. As such, rising energy prices boost the prices for all goods and services to the extent that firms pass through price increases.

More than 60 producer price index components are included and forecasted in the Moody's U.S. Macro Model. Most are forecast based on historical performance relative to demand and other relevant drivers. More aggregate producer price indexes are determined by a weighted average of other producer prices and labor costs. The weights reflect the composition of each producer price's factor inputs. The consumer price indexes in the Moody's U.S. Macro Model are driven by producer prices, labor costs, and import prices. Import price deflators, for example, are direct determinants of many of the indexes for consumption goods. The core components of consumer prices are determined by the appropriate price deflators. Oil and food prices are determined exogenously. Consumer expenditure deflators are primarily determined by related consumer price indexes, although in some cases more fundamental drivers are utilized. The aggregate PCE deflator is determined stochastically and component deflators are constrained to be consistent.

Monetary Policy and Financial Markets: The conduct of U.S. monetary policy by the Federal Open Market Committee (or "FOMC") of the Federal Reserve is a very important part of the financial environment surrounding U.S. and regional housing markets. The key benchmark short-term rate in the Moody's U.S. Macro Model is the federal funds rate. The federal funds rate[10] is determined within the model over the period including when former Fed Chair Paul Volker became chair of the Federal Reserve Board in 1979 through the end of the forecast period. This period includes a number of very different approaches to the conduct of monetary policy by the Federal Reserve, including former Chair Volker's implementation of monetarist theories, former Chair Alan Greenspan's policy of opportunistic disinflation, and former Chair Ben Bernanke's use of unconventional monetary policy tools to combat the "Great Recession" and financial crisis, and subsequent slower than desired recovery.

Despite the differences in approach, monetary policy as represented by the federal funds rate is included in the Moody's U.S. Macro Model with a so-called "Taylor Rule" specification—reflecting the Federal Reserve's dual objectives of fostering economic growth and maintaining long-term price stability. Developed by Stanford economist John Taylor, the Taylor Rule has been used as an important reference point for policymakers as they craft monetary policy as the economy has changed over time. The Taylor Rule is a central bank reaction function that computes an optimal federal funds rate from the equilibrium funds rate—that rate consistent with an economy operating at full-employment, growing at its potential with inflation at the Federal Reserve's target. Stock market volatility is also included in the reaction function to proxy for the impact of financial market stress on policymakers' views of the appropriate funds rate target. When the economy is operating at full employment and inflation is at the rate consistent with

[10] The federal funds rate is the interest rate at which depository institutions (banks and credit unions) lend reserve balances to other depository institutions overnight, on an uncollateralized basis. It is a benchmark rate that lays the groundwork for other consumer rates (like mortgage interest rates) that are charged in retail banking and other non-bank retail lending markets.

the Federal Reserve's definition of price stability, the federal funds rate should be equal to its equilibrium rate.

In addition, the Taylor Rule prescribes the central bank to lower interest rates when either inflation or the economy is operating below its respective target, and vice versa. The Taylor Rule has done a reasonable job in tracking actions by the FOMC since the late 1970s. As the Taylor Rule was vetted by accurately predicting Federal Reserve's actions, it provided financial markets a good metric to ascertain the path of monetary policy. For much of the period after the "Great Recession," the Taylor Rule called for a negative federal funds rate. Since a negative interest rate of any kind, much less a benchmark interest rate like the federal funds rate, is extremely unlikely in reality (not to mention a negative interest rate would also create major issues in the specification of any U.S. macro model), at a certain point close to "zero," a minimum, positive federal funds rate is imposed within the model.

For the remainder of the financial sector, money demand equations are derived from portfolio theory; the demand for cash depends on the level of income, the expected level of transactions, and the opportunity cost of holding liquid assets as opposed to other interest-earning instruments. Money in the Moody's U.S. Macro Model is not a single asset, but rather a group of asset categories with varying degrees of liquidity. At one end of the spectrum is currency, which can be exchanged directly for assets; money also includes savings and time accounts, and, at the other end of the spectrum, certificates of deposit. Required reserves—determined by the components of money demand and the monetary policy lever specifying the required ratio—define the demand for reserves in the banking system. Free reserves, defined as non-borrowed reserves less required reserves, are a measure of disequilibrium in the Moody's U.S. Macro Model. Total, borrowed, and excess reserves are included for completeness of U.S. financial markets within the Moody's U.S. Macro Model.

Personal Income and Corporate Profits: While the income side of the NIPA accounts is not as carefully followed as the demand side of the accounts, it is the income sector that makes macroeconomic models truly general equilibrium models. One household's spending is income to another household, while income generated by production is a constraint on final demand. Moreover, the distribution of income among households, businesses, and government has significant effects on the composition of output and on the dynamics of the business cycle. National income is defined as the sum of the payments to the factors of production. The Moody's U.S. Macro Model has behavioral equations for all nonprofit income flows including compensation of employees (wages and benefits), other labor income, employer contributions for social insurance, farm and nonfarm proprietors' income, and net interest paid by business.

Corporate profits with inventory valuation adjustment and capital consumption adjustment are estimated by quantitative methods such as regression on output, labor costs, and prices. Corporate cash flow is determined by subtracting dividends and corporate taxes from corporate profits and adding depreciation allowances. A key stock price variable in the U.S. Macro Model has been the S&P 500 Composite Stock Price Index. This is modeled as a function of after-tax profits, stock price volatility, and a distributed lag on the 10- year government bond rate. In 2015, a new variable, the Dow Jones total stock market index, has

been added to the model in order to meet Comprehensive Capital Analysis and Review reporting requirements. Over history, the two series have shown very similar behavior. Consequently, the S&P variable is the primary driver for the Dow Jones Index.

Labor Markets: The labor market sector in the Moody's U.S. Macro Model uses labor/employment concepts of two major types as defined by the U.S. Bureau of Labor Statistics: (1) payroll jobs (which is a full-time position by place of work), and (2) household labor/employment-unemployment (which is a count of job holder residents or unemployed based on where they live—and each individual is counted as one employed or unemployed if they meet the required criteria for "participating in the labor force," even if an employed resident holds more than one position or job).[11] Within the household data set, the labor force, the number of unemployed, and the rate of unemployment are all calculated for the household data series. Private payroll jobs is modeled within the Moody's U.S. Macro Model from both a top-down and bottom-up approach. Total private jobs are derived as a function of labor hours demanded, which in turn is a function of output. Labor hours are modeled based on lagged growth in output and labor productivity. Total payroll jobs are also modeled separately at the one-digit and two-digit NAICS level.

To properly examine industry specific employment impacts attributed to changes in consumer spending, business investment, trade and federal and state government spending, the Moody's U.S. Macro Model has incorporated data from the 1997 benchmark of the Bureau of Economic Analysis' U.S. Input-Output Accounts. In the Moody's Analytics U.S. Macro Model technical specifications, Moody's indicates that these data are used to generate quarterly estimates of gross product originating (GPO) by industry as follows:

> GPO by industry *equals* the industry's share of total consumption *times* Real personal consumption expenditures; *plus* the industry's share of investment *times* Real investment *plus* the industry's share of exports *times* Real exports *plus* the industry's share of imports *times* Real imports *plus* the industry's share of federal spending *times* Real federal gross investment and consumption *plus* the industry's share of state and local spending *times* Real state and local gross investment and consumption.

Industry payroll jobs depend on the industry specific gross product originating and productivity terms in some cases for construction jobs. This intermediate value of construction payroll jobs is then divided by the sum of all the intermediate estimates of job categories. This share is then applied to total private jobs

[11] It should be noted that this housing study uses both of these two employment concepts. In addition, this housing study uses a broader job concept as defined by the Bureau of Economic Analysis as part of its national income and product accounts program. The BEA definition of jobs is a broader employment-job concept than either of the series discussed above and was used (particularly in the Regional and Town models) because it presents a more complete employment-jobs picture that affects housing demand—including self-employed (proprietors), and farm and military jobs which are not a part of the Current Employment Survey (or CES) series from U.S. Bureau of Labor Statistics that counts nonfarm payroll jobs. The nonfarm payroll job concept which includes only non-agricultural jobs and does not include self-employed and proprietors. However, Moody's job-employment series are both important macro variables that provide important information on economic performance. As such, they remain key macro variables in the Moody's U.S. Macro Model and regional forecast model employed in this study.

estimated separately. Thus, relative industry payroll job shifts occur, even though the actual industry payroll job levels are "forced" to equal the change in top-line, total private payroll jobs.

Household employment (which again is the count of employed residents by where they live) is modeled as a function of total payroll jobs by place of work. The two measures of jobs-employment can vary over the business cycle given changes in the number of people holding multiple jobs and the number of self-employed. These differences should be captured in the national level variable. The labor force is determined by the working age population, real hourly compensation and the share of the population of prime working age. The rate of labor force participation is determined through an identity. The number of unemployed and the unemployment rate are determined as identities from the household employment and labor force projections.

The Personal Income sector of the Moody's U.S. Macro Model is further broken down into eight different components. Wages and salaries, the largest income category, are divided into manufacturing, private service producing, and construction and mining categories. In the same spirit as jobs-employment, wages and salaries are modeled from a top-down and bottom-up approach. Total wages and salaries are modeled as a function of average weekly earnings. Individual wage and salary categories are modeled as a function of industry employment, industry average hourly earnings, and a broad measure of hours worked. Outside of the wages and salaries category, the other non-wages and salaries income categories including supplements to wages and salaries, basically benefits, are estimated as a function of wages and salaries. The sizable constant term for this category of Personal Income in the Moody's U.S. Macro Model reflects the rapid growth in this category of income over the past two decades due to rising medical costs and nonwage benefits. Contributions for social insurance are also a function of wages and salaries and tax rates.

Interest income in the Moody's U.S. Macro Model is estimated from a regression on a weighted average of short- and long-term interest rates. Dividend income is a function of corporate dividend payments. Rental income is exogenous, and proprietors' income is derived from output and profits. Transfer payments in the Moody's U.S. Macro Model are a function primarily of the share of the population over 65 since Social Security benefits are the largest component. The unemployment rate and the rate of consumer price inflation also play a role in the Moody's U.S. Macro Model for this component.

Housing: The housing sector determines the number of single-family and multifamily housing permits, starts, completions, new- and existing-home sales, house prices, mortgage originations for purchase and refinancing, and mortgage delinquency and foreclosure rates. Over the long run, demographic factors such as household formation and income growth drive growth of the housing market. Business cycles and construction cycles, as represented by the jobless rate and the availability and cost of labor and building materials, will create disequilibrium between housing demand and supply in the short run. The Moody's U.S. Macro Model of housing measures includes both these long-term and short-term forces, and provides important background for the MSA housing unit demand and unit supply estimates.

In the Moody's U.S. Macro Model, the demand for homes as expressed by new- and existing-home sales is related to household formation over the long term. Real, or inflation-adjusted, per household income growth is also an important determinant of housing demand as higher incomes make it possible for more households to buy a housing unit. The user cost of housing, or the after tax interest cost of owning a home less the expected return to buying a home, is a short-term driver of housing sales. The higher the user cost, the lower the housing unit sales. The expected return to buying a house is expected house price appreciation. The housing sales equations also include a measure of credit availability: with looser lending standards helping drive sales over the near term.

Similarly, the level of housing permits issued is largely determined by the number of household formations over the long term. Over time, the level of housing permits issued will closely follow the number of new household formations, after considering demolitions. However, permits and household formations are not equal in each period, given changes in the business cycle and building activity. Within the Moody's U.S. Macro Model, also affecting starts and sales are the general economic conditions as represented by employment or income growth, the user cost of housing, and the availability of credit. Credit availability has become a particularly important factor influencing the level of housing unit construction given recent changes in bank capital standards and the emphasis of bank regulators on credit quality. In the Moody's U.S. Macro Model, single-family housing permits are modeled based on relationships of the 30-year fixed mortgage rates to a four-quarter moving average of single family housing prices, the loan to housing price ratio, the ratio of fixed 30-year mortgage rates to 30-year adjustable mortgage rates, and real disposable income growth per household in the economy over time.

House prices within the Moody's U.S. Macro Model are specified as a function of factors that influence both the demand and supply of housing. The demand for housing depends on income per household, the jobless rate, after-tax borrowing costs, credit availability, and the distress sale share of total existing-housing sales. Income per household measures both the ability and willingness of households to purchase a home. Rising income levels in the Moody's U.S. Macro Model will result in increased house buying activity. The jobless rate also impacts consumers' willingness to buy. If consumer confidence is low, house purchases will remain lackluster even if income levels are growing. Finally, the distress sale share of total existing-house sales has had a significant impact on house prices during the recent housing boom-bust cycle, representing discounted excess supply of housing. House price appreciation and changes in the distress share are inversely correlated. As such, the Moody's U.S. Macro Model treat distress share as an explanatory variable in the house price model.

Purchase mortgage originations are modeled as a function of the value of new- and existing-home sales and the loan-to-value ratio. To account for the changing share of home sales that are for cash, the Moody's U.S. Macro Model includes the mortgage foreclosure rate. The cash share of home sales tends to be greater when there are more distress sales that are purchased by investors with cash. Refinance originations as a share of mortgage debt outstanding are determined by the difference between the current 30-year fixed mortgage interest rate and the average rate over the last five years (the average duration of a mortgage loan). The spread between interest rates on fixed and adjustable rate mortgages is also included in the

model to capture the desire of ARM borrowers to refinance and lock in fixed rates when those rates are low.

Mortgage delinquency rates are determined by employment growth, house price changes, household financial obligations, and loan-to-value ratios. Job-employment growth reflects the ability of homeowners to meet their mortgage payments, while the change in house prices captures changes in the level of homeowners' equity. Significant declines in equity values are necessary before homeowners will stop making their mortgage payments altogether. Mortgage foreclosures are also included in the Moody's U.S. Macro Model as a function of lagged mortgage delinquencies, real house price movements, household financial obligations, and employment growth. The housing sector has been expanded substantially since the housing boom and bust cycle of the mid-2000s. Some notable additions to the Moody's U.S. Macro Model in the housing activity sector include the CoreLogic Case-Shiller® 20-City Single-Family House Price Index, single-family months of supply at current sales rate, and new single-family houses for sale.

Table 2.1 U.S. Macro Forecast Variables from Moody's Analytics

U.S. Economic Forecast Summary	1990	2001	2007	2017	2022	2027	Average Annual Percent Change 1990-01	2001-07	2007-17	Average Annual Percent Change 2017-22	2022-27	2017-27
Indicators	History				Forecast		History			Forecast		
Real National Income Accounts (Billions of Chained 2009 Dollars)												
Real Gross Domestic Product	8,955	12,682	14,874	17,096	19,238	21,168	3.2%	2.7%	1.4%	2.4%	1.9%	2.2%
Real Personal Income	7,275	10,611	12,358	14,583	16,070	17,849	3.5%	2.6%	1.7%	2.0%	2.1%	2.0%
Real Per Capita Income ($/Person)	29,081	37,204	40,962	44,735	47,705	51,257	2.3%	1.6%	0.9%	1.3%	1.4%	1.4%
Price and Wage Indexes												
U.S. Consumer Price Index (1982-84=100)	130.7	177.0	207.3	245.1	276.0	308.2	2.8%	2.7%	1.7%	2.4%	2.2%	2.3%
GDP Implicit Price Deflator (2009=100)	66.8	83.8	97.3	113.4	126.5	139.2	2.1%	2.5%	1.5%	2.2%	1.9%	2.1%
Current Dollar National Income (Billions of Dollars)												
Personal Income	4,906	8,992	12,000	16,429	20,243	24,676	5.7%	4.9%	3.2%	4.3%	4.0%	4.2%
Wages & Salaries	2,741	4,954	6,395	8,353	10,293	12,432	5.5%	4.3%	2.7%	4.3%	3.8%	4.1%
Non-Wage & Salaries	2,165	4,037	5,605	8,076	9,949	12,244	5.8%	5.6%	3.7%	4.3%	4.2%	4.2%
Dividends, Interest & Rent	1,023	1,649	2,356	3,186	3,820	4,652	4.4%	6.1%	3.1%	3.7%	4.0%	3.9%
Transfer Receipts	597	1,193	1,728	2,860	3,586	4,456	6.5%	6.4%	5.2%	4.6%	4.4%	4.5%
Per Capita Income ($/Person)	19,611	31,525	39,775	50,398	60,091	70,862	4.4%	4.0%	2.4%	3.6%	3.4%	3.5%
Median Household Income ($/Household)	31,102	42,703	50,740	59,442	68,984	79,679	2.9%	2.9%	1.6%	3.0%	2.9%	3.0%
Labor Force and Employment (Millions)												
U.S. Civilian Labor Force	125.9	144	153	160	167	173	1.2%	1.1%	0.5%	0.8%	0.7%	0.8%
Total U.S. Employment	118.8	137	146	153	159	164	1.3%	1.1%	0.5%	0.7%	0.7%	0.7%
Unemployment Rate (%)	5.62	4.74	4.62	4.35	4.94	5.23	-1.5%	-0.4%	-0.6%	2.6%	1.2%	1.9%
Nonfarm Payroll Employment	109.5	132.1	138.0	146.6	152.7	157.5	1.7%	0.7%	0.6%	0.8%	0.6%	0.7%
Private Nonfarm	91.1	111.0	115.8	124.3	130.0	133.9	1.8%	0.7%	0.7%	0.9%	0.6%	0.7%
Natural Resources and Mining	0.8	0.6	0.7	0.7	0.8	0.7	-2.1%	3.0%	-0.6%	2.4%	-0.4%	1.0%
Construction	5.3	6.8	7.6	7.0	7.9	8.2	2.4%	1.9%	-0.9%	2.6%	0.7%	1.7%
Manufacturing	17.7	16.4	13.9	12.4	12.0	11.2	-0.7%	-2.8%	-1.1%	-0.7%	-1.3%	-1.0%
Transportation and Utilities	4.2	5.0	5.1	5.7	5.8	5.8	1.5%	0.4%	1.2%	0.3%	-0.1%	0.1%
Information	2.7	3.6	3.0	2.8	2.8	2.8	2.8%	-3.0%	-0.8%	0.0%	0.0%	0.0%
Wholesale Trade	5.3	5.8	6.0	5.9	6.1	6.2	0.8%	0.7%	-0.2%	0.6%	0.4%	0.5%
Retail Trade	13.2	15.2	15.5	15.9	16.1	16.4	1.3%	0.3%	0.2%	0.3%	0.4%	0.3%
Financial Activities	6.6	7.9	8.3	8.5	8.7	9.2	1.6%	0.9%	0.1%	0.7%	1.0%	0.9%
Professional and Business Services	10.8	16.5	17.9	20.5	22.1	23.6	3.9%	1.4%	1.3%	1.6%	1.3%	1.4%
Education and Health Services	11.0	15.8	18.7	23.2	24.6	25.9	3.3%	2.8%	2.2%	1.2%	1.0%	1.1%
Leisure and Hospitality	9.3	12.0	13.4	16.1	17.1	17.9	2.4%	1.8%	1.8%	1.2%	1.0%	1.1%
Other Services	4.3	5.3	5.5	5.8	5.9	6.0	1.9%	0.7%	0.5%	0.5%	0.2%	0.3%
Government	18.4	21.1	22.2	22.3	22.7	23.7	1.3%	0.8%	0.0%	0.4%	0.8%	0.6%
Government - Federal	3.2	2.8	2.7	2.8	2.9	2.9	-1.3%	-0.2%	0.3%	0.8%	0.2%	0.5%
Government - State and Local	15.2	18.4	19.5	19.5	19.8	20.7	1.7%	1.0%	0.0%	0.3%	0.9%	0.6%
Population (Millions)												
Total Population	250.04	285.31	301.59	326.01	336.86	348.22	1.2%	0.9%	0.8%	0.7%	0.7%	0.7%
Ages Less than 5 Years	18.90	19.31	20.15	20.04	20.37	20.59	0.2%	0.7%	-0.1%	0.3%	0.2%	0.3%
Ages 5 to 19 Years	53.08	61.63	62.65	62.15	61.69	61.75	1.4%	0.3%	-0.1%	-0.1%	0.0%	-0.1%
Ages 20 to 44 Years	100.39	104.28	103.59	108.37	112.11	114.85	0.3%	-0.1%	0.5%	0.7%	0.5%	0.6%
Ages 45 to 64 Years	46.35	64.77	77.26	84.37	82.70	82.15	3.1%	3.0%	0.9%	-0.4%	-0.1%	-0.3%
Ages 65 Years and Greater	31.32	35.32	37.95	51.08	59.98	68.88	1.1%	1.2%	3.0%	3.3%	2.8%	3.0%
Total Households	92.07	93.39	94.76	96.31	97.73	99.27	0.1%	0.2%	0.2%	0.3%	0.3%	0.3%
Miscellaneous Indicators												
FHFA Home Price Index, (1980Q1=100, SA)	165.0	252.2	375.8	400.2	459.4	565.5	3.9%	6.9%	0.6%	2.8%	4.2%	3.5%
FHA/VA 30-Year Fixed Mortgage Rate (%, NSA)	10.0	7.0	6.5	4.1	5.5	5.8	-3.2%	-1.3%	-4.4%	5.9%	1.0%	3.4%
Housing Starts (Millions, SAAR)	1.20	1.60	1.34	1.21	1.93	1.63	2.6%	-2.9%	-1.0%	9.8%	-3.3%	3.1%
Starts, Single-Family (Millions, SAAR)	0.90	1.27	1.04	0.85	1.47	1.28	3.2%	-3.4%	-1.9%	11.5%	-2.8%	4.1%
Starts, Multi-Family (Millions, SAAR)	0.30	0.33	0.31	0.36	0.46	0.36	0.8%	-1.2%	1.5%	5.0%	-4.8%	0.0%
Existing Home Sales, Single-Family (Millions, SAAR)	2.92	4.73	4.42	4.91	4.92	5.13	4.5%	-1.1%	1.1%	0.0%	0.8%	0.4%
Existing Home Price, Single-Family (Median $)	96,755	154,422	215,544	247,792	294,622	361,952	4.3%	5.7%	1.4%	3.5%	4.2%	3.9%

Notes: N/A is "Not Available"; SA is "Seasonally Adjusted"; NSA is "Not Seasonally Adjusted"; SAAR is "Seasonally Adjusted Annual Rate"

Source: Moody's Analytics May-June 2018 US Forecast 6.30.2018 *Prepared by Economic & Policy Resources, Inc.*

Overview of the Regional MSA and Town Forecasting Process

According to the above technical description of the Moody's U.S. Macro Model, the model specifies, estimates, and then solves simultaneously, a large set of equations that "mirror the structural workings" of the U.S. economy. The model is maintained on a monthly basis by Moody's Analytics, and produces a short-term and long-term economic and demographic forecast for the U.S. economy. The structural model uses historical data from the various federal agencies which develop, publish and periodically revise these data on a regular basis. For this study, the U.S. macroeconomic forecast through calendar year 2027 that comes from the Moody's U.S. Macro Model forms the basis for the external macroeconomic drivers that help determine the short-term and long-term economic and demographic forecast for the regional MSA economy. Table 2.2 (on the following page) shows the key macroeconomic variables from the Moody's Forecast which form the important U.S. economic and demographic background for the region's and town's short-term and long-term economic and demographic forecast.

As such, the first step in creating the economic and demographic forecast (including the detailed population forecast) for the region, and subsequently the Town, is derived from the Moody's Forecast, and more geographically-specific economic and demographic data from a special baseline forecast that was commissioned by the EPR-Crane Associates Team from Moody's Analytics for the regional economy. More specifically, the EPR-Crane Associates Team in March 2018 developed a comprehensive regional economic and demographic forecast through calendar year 2027 for the Glens Falls Metropolitan Statistical Area ("MSA") derived from Moody's regional model for the MSA, whose two-county area (Warren and Washington Counties) includes the entire Town of Queensbury, using the Moody's Forecast for the U.S. economy as the basis for that regional forecast.

The Moody's regional macro model, like the Moody's U.S. Macro Model, specifies, estimates, and solves simultaneously a large set of equations that mirror the structural workings of the MSA's economy in relation to the external drivers that are part of the U.S economic forecast—in this case the Moody's Forecast (completed in May-June of 2018). As mentioned above, by adopting a middle ground, the Moody's model is able to include a significant number of endogenous indicators to help explain historic changes in economic, financial, and demographic trends and to forecast future trends in GDP, interest rates and inflation and the resulting regional implications of that U.S. forecast for the region and the Town.

Over the longer term, the Moody's model construct allows the numerous and interrelated macro-economic variables that will impact the short-term and longer-term economic and demographic indicators (including population) to play themselves out in a detailed economic and demographic forecast for the region and Town. The Moody's regional model for the MSA incorporates natural population changes, births minus deaths, but also includes in population changes (both population declines or increases) driven by the region's economics—in that it assumes the economy influences the most important component of population dynamics, the in- and out-migration of resident population.

In the next section, we turn to a brief explanation on the difference between the Cornell's Program of Applied Demographics Population Projection for Warren and Washington Counties and the results of Moody's Analytics Glens Falls MSA economic and demographic forecast as adjusted by the EPR-Crane Associates Team for the Town that was used as the economic and demographic background in this town housing study.

Table 2.2 Glens Falls MSA Variables from Moody's Analytics

Glens Falls Metro Region	1990	2001	2007	2017	2022	2027	Average Annual Percent Change 1990-01	2001-07	2007-17	Average Annual Percent Change 2017-22	2022-27	2017-27
Indicators	History				Forecast		History			Forecast		
Real Metro/Regional Income Accounts (Millions of Chained 2009 Dollars)												
Real Gross Metro Product	4,017	4,971	5,642	6,115	6,846	7,501	2.0%	2.1%	0.8%	2.3%	1.8%	2.1%
Real Personal Income	2,957	3,766	4,162	4,906	5,171	5,569	2.2%	1.7%	1.7%	1.1%	1.5%	1.3%
Real Per Capita Income ($/Person)	24,811	30,230	32,304	38,867	40,396	42,864	1.8%	1.1%	1.9%	0.8%	1.2%	1.0%
Price and Wage Index												
Regional Consumer Price Index (1982-84=100)	136.2	181.4	216.4	250.5	281.4	313.5	2.6%	3.0%	1.5%	2.4%	2.2%	2.3%
Current Dollar Metro/Regional Income Accounts (Millions of Dollars)												
Personal Income	1,994	3,191	4,042	5,527	6,527	7,721	4.4%	4.0%	3.2%	3.4%	3.4%	3.4%
Wages & Salaries	1,041	1,473	1,885	2,383	2,763	3,212	3.2%	4.2%	2.4%	3.0%	3.1%	3.0%
Non-Wage & Salaries	954	1,718	2,157	3,144	3,764	4,509	5.5%	3.9%	3.8%	3.7%	3.7%	3.7%
Dividends, Interest & Rent	420	530	545	888	1,079	1,308	2.1%	0.5%	5.0%	4.0%	3.9%	4.0%
Transfer Receipts	297	578	838	1,322	1,602	1,941	6.2%	6.4%	4.7%	3.9%	3.9%	3.9%
Per Capita Income ($/Person)	16,731	25,616	31,368	43,786	50,991	59,430	3.9%	3.4%	3.4%	3.1%	3.1%	3.1%
Median Household Income ($/Household)	29,970	39,932	46,586	55,045	60,280	70,027	2.6%	2.6%	1.7%	1.8%	3.0%	2.4%
Median Household Income--Owner ($/Household)	33,786	45,448	53,271	66,033	74,344	84,395	2.7%	2.7%	2.2%	2.4%	2.6%	2.5%
Median Household Income-Renter ($/Household)	17,031	22,910	26,853	31,925	36,086	40,933	2.7%	2.7%	1.7%	2.5%	2.6%	2.5%
Metro/Regional Labor Force and Employment (Thousands)												
Regional Civilian Labor Force	59.45	63.36	68.73	60.72	61.51	62.43	0.6%	1.4%	-1.2%	0.3%	0.3%	0.3%
Total Regional Employment	56.11	60.69	65.78	57.67	58.21	59.03	0.7%	1.4%	-1.3%	0.2%	0.3%	0.2%
Unemployment Rate (%)	5.61	4.22	4.30	5.03	5.35	5.44	-2.6%	0.3%	1.6%	1.3%	0.3%	0.8%
Total Regional Employment (BEA)	60.60	65.18	71.24	71.35	72.62	74.07	0.7%	1.5%	0.0%	0.4%	0.4%	0.4%
Wage & Salary Employment (BEA)	49.41	52.49	55.58	55.67	57.10	58.42	0.6%	1.0%	0.0%	0.5%	0.5%	0.5%
Proprietors Employment (BEA)	11.20	12.69	15.66	15.68	15.52	15.66	1.1%	3.6%	0.0%	-0.2%	0.2%	0.0%
Nonfarm Payroll Employment	48.21	52.95	56.13	55.86	57.64	59.11	0.9%	1.0%	0.0%	0.6%	0.5%	0.6%
Private Nonfarm	38.46	42.21	44.88	45.47	47.02	48.23	0.8%	1.0%	0.1%	0.7%	0.5%	0.6%
Natural Resources and Mining	0.37	0.29	0.34	0.23	0.25	0.25	-2.1%	2.5%	-4.0%	1.8%	-0.1%	0.9%
Construction	2.03	1.88	2.54	2.50	2.76	2.81	-0.7%	5.1%	-0.2%	2.0%	0.4%	1.2%
Manufacturing	9.67	7.23	6.61	5.85	5.66	5.49	-2.6%	-1.5%	-1.2%	-0.7%	-0.6%	-0.6%
Transportation and Utilities	1.46	0.96	0.87	0.88	0.89	0.89	-3.8%	-1.5%	0.1%	0.2%	-0.1%	0.1%
Information	0.97	1.33	1.10	0.90	0.91	0.91	3.0%	-3.2%	-2.0%	0.2%	0.2%	0.2%
Wholesale Trade	1.57	0.98	1.16	1.18	1.23	1.25	-4.2%	2.8%	0.2%	0.8%	0.3%	0.6%
Retail Trade	6.73	7.31	7.70	7.54	7.79	7.88	0.8%	0.9%	-0.2%	0.7%	0.2%	0.4%
Financial Activities	1.34	2.11	2.12	1.95	2.12	2.37	4.2%	0.0%	-0.8%	1.7%	2.2%	1.9%
Professional and Business Services	2.16	4.24	5.32	5.58	5.88	6.18	6.3%	3.8%	0.5%	1.0%	1.0%	1.0%
Education and Health Services	4.96	7.26	8.04	8.51	8.90	9.29	3.5%	1.7%	0.6%	0.9%	0.9%	0.9%
Leisure and Hospitality	5.79	6.91	6.81	7.89	8.21	8.47	1.6%	-0.2%	1.5%	0.8%	0.6%	0.7%
Other Services	1.40	1.69	2.27	2.46	2.43	2.45	1.8%	5.0%	0.8%	-0.2%	0.2%	0.0%
Government	9.75	10.74	11.25	10.39	10.63	10.87	0.9%	0.8%	-0.8%	0.4%	0.5%	0.5%
Government - Federal	0.43	0.35	0.39	0.32	0.35	0.36	-1.9%	1.9%	-2.0%	2.0%	0.4%	1.2%
Government - State and Local	9.32	10.39	10.86	10.07	10.27	10.51	1.0%	0.7%	-0.7%	0.4%	0.5%	0.4%
Population (Number)												
Total Population	119,192	124,579	128,853	126,218	128,011	129,917	0.4%	0.6%	-0.2%	0.3%	0.3%	0.3%
Ages Less than 5 Years	8,543	6,700	6,473	5,921	5,966	5,841	-2.2%	-0.6%	-0.9%	0.2%	-0.4%	-0.1%
Ages 5 to 19 Years	25,085	26,628	25,101	20,222	19,668	19,523	0.5%	-1.0%	-2.1%	-0.6%	-0.1%	-0.4%
Ages 20 to 44 Years	46,253	41,519	39,719	36,533	37,185	37,271	-1.0%	-0.7%	-0.8%	0.4%	0.0%	0.2%
Ages 45 to 64 Years	22,908	31,473	37,822	38,105	36,429	34,927	2.9%	3.1%	0.1%	-0.9%	-0.8%	-0.9%
Ages 65 Years and Greater	16,403	18,258	19,738	25,438	28,763	32,355	1.0%	1.3%	2.6%	2.5%	2.4%	2.4%
Births	426	319	326	277	278	272	-2.6%	0.4%	-1.6%	0.1%	-0.5%	-0.2%
Deaths	278	300	307	334	335	345	0.7%	0.4%	0.8%	0.1%	0.6%	0.3%
Natural Change (Births minus Deaths)	148	19	19	-57	-57	-73	-17.0%	-0.1%	N/A	-0.1%	5.1%	2.5%
Net Migration	232	95	104	84	150	169	-7.8%	1.5%	-2.1%	12.3%	2.4%	7.2%
Total Households	42,926	48,684	51,618	53,371	55,259	57,053	1.2%	1.0%	0.3%	0.7%	0.6%	0.7%
Miscellaneous Indicators (Number)												
FHFA Housing Price Index (1995:Q1=100)	N/A	109.11	197.20	195.72	219.80	271.19	N/A	10.4%	-0.1%	2.3%	4.3%	3.3%
Housing Starts (SAAR)	786	417	534	335	697	623	-5.6%	4.2%	-4.6%	15.8%	-2.2%	6.4%
Housing Completions (SAAR)	899	467	687	344	641	653	-5.8%	6.7%	-6.7%	13.3%	0.4%	6.6%
Existing Home Sales, Single-Family (SAAR)	2,154	2,371	1,729	2,048	1,745	1,811	0.9%	-5.1%	1.7%	-3.2%	0.8%	-1.2%
Existing Home Price, Single-Family (Median $)	83,473	88,660	165,610	162,014	193,697	244,943	0.5%	11.0%	-0.2%	3.6%	4.8%	4.2%

Notes: N/A is "Not Available"; SA is "Seasonally Adjusted"; NSA is "Not Seasonally Adjusted"; SAAR is "Seasonally Adjusted Annual Rate"; BEA is Bureau of Economic Analysis

Sources: Moody's Analytics May-June 2018 Glens Falls MSA Forecast 6.30.2018 and Economic & Policy Resources *Prepared by Economic & Policy Resources, Inc.*

Table 2.3 Queensbury Forecast Variables from EPR

Queensbury	1990	2000	2010	2016	2022	2027	Average Annual Percent Change 1990-00	2000-10	2010-16	Average Annual Percent Change 2016-22	2022-27	2016-27
Indicators	History				Forecast		History			Forecast		
Current Dollar Town Income Accounts (Thousands of Dollars)												
Personal Income	522,651	833,383	1,235,206	1,534,301	1,844,146	2,180,816	4.8%	4.0%	3.7%	3.1%	3.4%	3.2%
Wages & Salaries	334,116	538,844	798,559	909,525	1,069,316	1,246,897	4.9%	4.0%	2.2%	2.7%	3.1%	2.9%
Non-Wage & Salaries	188,535	294,539	436,646	624,776	774,830	933,919	4.6%	4.0%	6.2%	3.7%	3.8%	3.7%
Dividends, Interest & Rent	117,478	180,570	189,657	313,873	384,342	461,536	4.4%	0.5%	8.8%	3.4%	3.7%	3.6%
Transfer Receipts	71,058	113,969	246,990	310,903	390,488	472,382	4.8%	8.0%	3.9%	3.9%	3.9%	3.9%
Per Capita Income ($/Person)	23,095	32,757	44,271	55,661	66,501	77,083	3.6%	3.1%	3.9%	3.0%	3.0%	3.0%
Median Household Income ($/Household)	34,337	45,547	61,009	65,914	73,823	83,929	2.9%	3.0%	1.3%	1.9%	2.6%	2.2%
Median Household Income--Owner ($/Household)	40,149	53,257	72,688	76,714	86,222	97,998	2.9%	3.2%	0.9%	2.0%	2.6%	2.3%
Median Household Income-Renter ($/Household)	21,708	28,795	39,286	38,095	42,984	48,217	2.9%	3.2%	-0.5%	2.0%	2.3%	2.2%
Town Labor Force and Employment (Numbers)												
Town Civilian Labor Force	12,217	13,466	14,335	13,720	13,786	14,050	1.0%	0.6%	-0.7%	0.1%	0.4%	0.2%
Total Town Employment	11,703	12,977	13,230	13,106	13,138	13,369	1.0%	0.2%	-0.2%	0.0%	0.3%	0.2%
Unemployment Rate (%)	4.21	3.63	7.46	4.48	4.70	4.85	-1.5%	7.5%	-8.2%	0.8%	0.6%	0.7%
Total Town Employment (BEA)	12,161	13,485	13,612	13,930	14,200	14,638	1.0%	0.1%	0.4%	0.3%	0.6%	0.5%
Wage & Salary Employment (BEA)	10,772	11,945	11,959	12,652	12,903	13,301	1.0%	0.0%	0.9%	0.3%	0.6%	0.5%
Proprietors Employment (BEA)	1,389	1,540	1,653	1,278	1,297	1,337	1.0%	0.7%	-4.2%	0.3%	0.6%	0.4%
Population (Number)												
Total Population	22,630	25,441	27,901	27,565	27,731	28,292	1.2%	0.9%	-0.2%	0.1%	0.4%	0.2%
Ages Less than 5 Years	1,507	1,471	1,267	1,175	1,175	1,157	-0.2%	-1.5%	-1.2%	0.0%	-0.3%	-0.1%
Ages 5 to 19 Years	5,016	5,480	5,389	5,013	4,778	4,767	0.9%	-0.2%	-1.2%	-0.8%	0.0%	-0.5%
Ages 20 to 44 Years	8,537	8,245	7,449	7,163	7,168	7,207	-0.3%	-1.0%	-0.6%	0.0%	0.1%	0.1%
Ages 45 to 64 Years	4,549	6,386	8,834	8,666	8,170	7,869	3.5%	3.3%	-0.3%	-1.0%	-0.7%	-0.9%
Ages 65 Years and Greater	3,021	3,859	4,962	5,548	6,440	7,869	2.5%	2.5%	1.9%	2.5%	4.1%	3.2%
Births	N/A	253	246	246	233	229	N/A	-0.3%	0.0%	-0.8%	-0.4%	-0.6%
Deaths	N/A	239	289	277	293	303	N/A	2.0%	-0.7%	0.9%	0.7%	0.8%
Natural Change (Births minus Deaths)	N/A	15	-43	-32	-59	-74	N/A	N/A	-5.1%	11.0%	4.6%	8.1%
Net Migration	N/A	204	135	78	156	195	N/A	-4.0%	-8.8%	12.4%	4.6%	8.8%
Total Households	22,428	25,115	27,474	27,249	27,386	27,924	1.1%	0.9%	-0.1%	0.1%	0.4%	0.2%
Miscellaneous Indicators (Number)												
Home Price Index, (Index 2000=100, SA)	N/A	100.0	172.5	190.8	210.3	256.0	N/A	5.6%	1.7%	1.6%	4.0%	2.7%

Notes: N/A is "Not Available"; SA is "Seasonally Adjusted"; NSA is "Not Seasonally Adjusted"; SAAR is "Seasonally Adjusted Annual Rate"; BEA is Bureau of Economic Analysis

Source: Economic & Policy Resources, Inc. *Prepared by Economic & Policy Resources, Inc.*

Moody's Model and EPR Team Projections vs. Population Projections from the Cornell Program of Applied Demographics

Moody's collects the historical data and their team of economists sets up the theory-bound structural equations to explain and forecast economic, financial and demographic trends for 382 Metropolitan Statistical Areas (MSAs) and 50 states. Included in that system is a regional economic and demographic forecasting model for the Glens Falls MSA—as one of the MSAs. This forecast from Moody's Analytics, which was created in March of 2018 based on the May-June 2018 Moody's Forecast for the U.S. economy, differs from the analysis presented in the recent *Long-term Population Projections for New York and its Counties* produced by demographers at Cornell University's Program on Applied Demographics ("PAD") in September 2018.

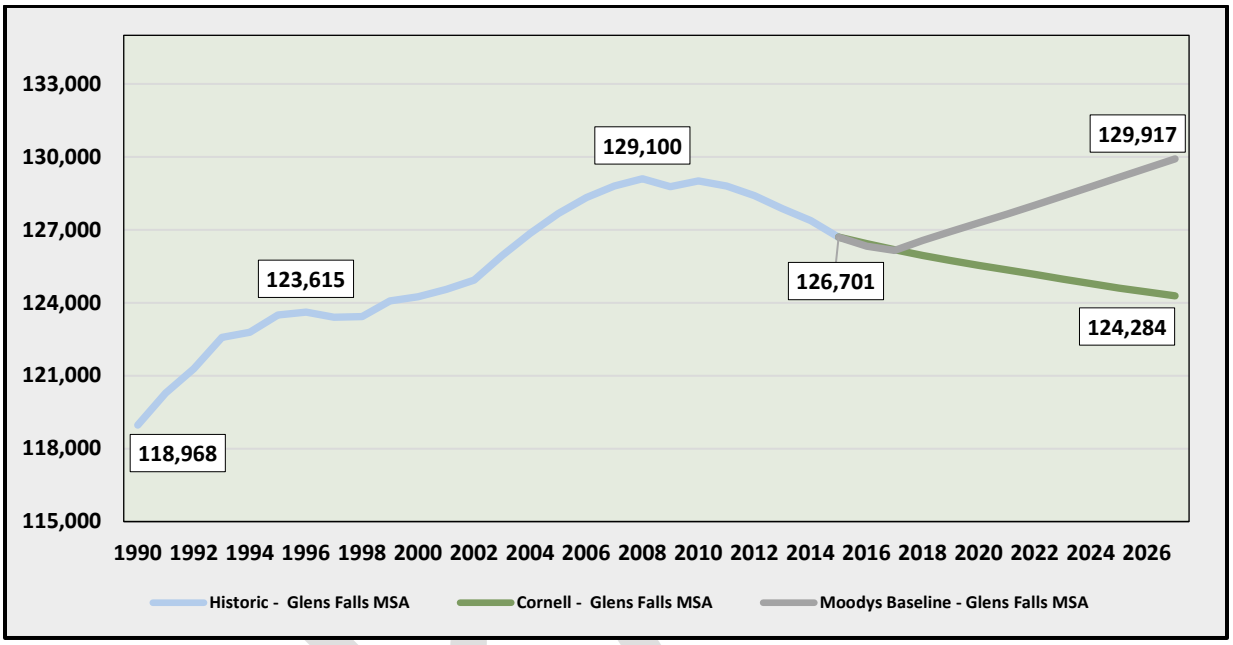
While Moody's is forecasting demographic change, in this case population, as it relates to structural economic change in the region, Cornell PAD is projecting demographic change based solely on a historical or retrospective view of past demographic data and trends. Moody's Analytics, therefore, takes a forward-looking, more holistic approach to the economics and demographics of the region, forecasting the region's future economic performance and demographic changes within a larger prospective view of the region's [and by extension—the Town's] economic, financial, and demographic picture. A caveat to the Moody's Analytics method is that all of the various economic, financial, and demographic variables are to some degree endogenous to the model and slight changes in one or many indicators could significantly impact the economic and demographic forecast developed for this study. Moody's Analytics updates the U.S. Macro Model every month, including periodic re-specification of underlying equations to help improve the model's forecasting accuracy—which necessitates continuous revision and updates. However, the requirements of this study necessitate that an initial, foundational forecast of the economic and demographic determinants of housing demand be agreed to and that this forecast have the longevity to keep the study's long term forecasts and findings relevant for as long a period of time into the future as it can. This seems particularly important given the aging of the U.S. economic cycle, and the recent global economic and political uncertainties that may complicate achieving that longevity objective for this study.

More specifically, the Cornell PAD uses a retrospective or backward-looking cohort component modeling approach that considers components of population change through a strict and direct version of recent historic population dynamics. This is clearly a less complicated forecasting approach. However, such an approach neither takes into account the underlying economic trends influencing population and demographic changes, nor does it consider more than a few variables (for example in- and out-migration, birth, and death rates) relative to the economic models with a large number of inputs. While in certain situations (such as a study with a short-term time horizon), it is appropriate to view the demographic future as a mere extension of a region's demographic past[12], the EPR-Crane Associates Team did not believe this was a robust enough approach nor the best, fully-considered methodology on which to base a regional housing demand and supply study that covers a ten-year period going forward. After thorough analysis,

[12] This is particular relevant with respect to natural change (births vs. deaths) within the region.

EPR concluded that a structural macroeconomic model for the MSA—and for the Town of Queensbury was necessary to forecast future housing supply and demand because of the interplay between the housing market and the overall economy of the region and the national economy. Figure 2.1 (below) shows how these two different approaches-methodologies can lead to significantly different forecasts of resident population for the future. These differences can become large, especially as the prospective timeline approaches ten years out into the future.

Figure 2.1: Moody's Analytics Baseline Forecast vs. Cornell PAD's Projection for Glens Falls MSA



Key Economic Variables

The projection performed by the Cornell PAD continues the negative trend in population change which the region has actually experienced since 2010. The Cornell PAD projects this trend into the future using estimated data regarding migration rates (from 2012 to 2016) from the U.S. Census Bureau and natality-mortality rates data (from 2000 to 2017) from the U.S. Centers for Disease Control and Prevention. The baseline Moody's forecast for the MSA region includes the expectation that the region's population will actually increase in the future, despite the actual population decline experienced over the period. As mentioned previously, the Moody's forecast incorporates exogenous economic drivers of population and demographic change, rather than exclusively at the historical performance of individual population components and demographic variables. Population is only one variable in Moody's regional economic and demographic structural model for the MSA region. It is prudent, then to examine some non-demographic variables in the MSA model that can help explain why population is forecasted to grow.

As shown in Figure 2.2 below, Industrial Production and Retail Sales in the MSA all experienced a major decline from calendar year 2007 through calendar year 2009, as we would expect with the onset of the "Great Recession." Since 2010, however, Real Gross Product along with Industrial Production and Retail Sales experienced variable periods of growth and contraction and are forecasted to continue to do so in the

near future, trending towards long-term positive growth. It is intuitive then to expect the population to increase in order to enable or support this expected future economic growth. However, taking into consideration the recent historical trend, the EPR-Crane Associates Team would not expect it to be substantial. Thus, the EPR-Crane Associates Team arrives at how Moody's regional economic and demographic forecasting model is generally set up: economic theory and expectations would dictate some population growth but the historical trend is warning that likely near-term future population increases will be somewhat tempered from a historical perspective. Taking a look at the wider historical context of population growth coupled with Moody's forecast in Figure 2.3 on the following page, the EPR-Crane Associates Team believes that this is the more fully-considered, reasonable projection for resident population change through calendar year 2027 when compared to the historical, more narrowly-focused projection technique employed by the Cornell PAD.

Figure 2.2: Moody's Analytics Economic Indicators – Glens Falls Historical and Forecasted—Annual Rate of Change (%)

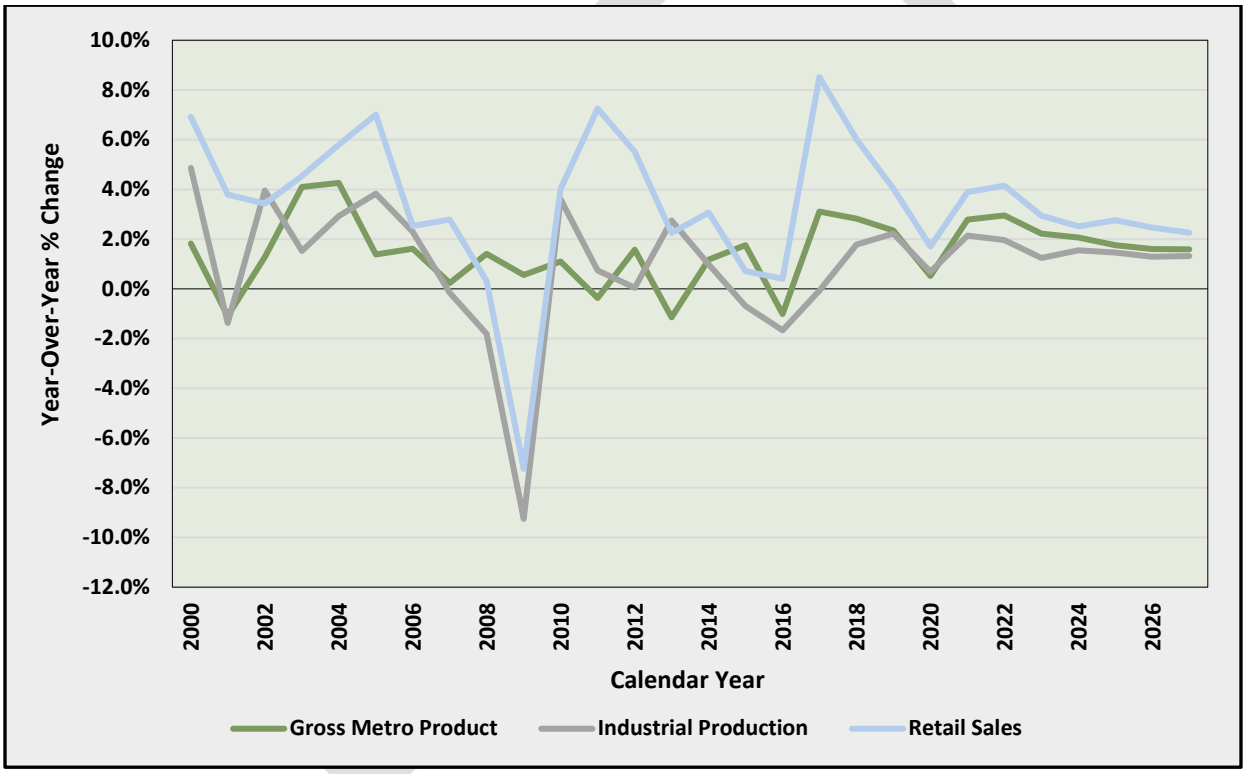
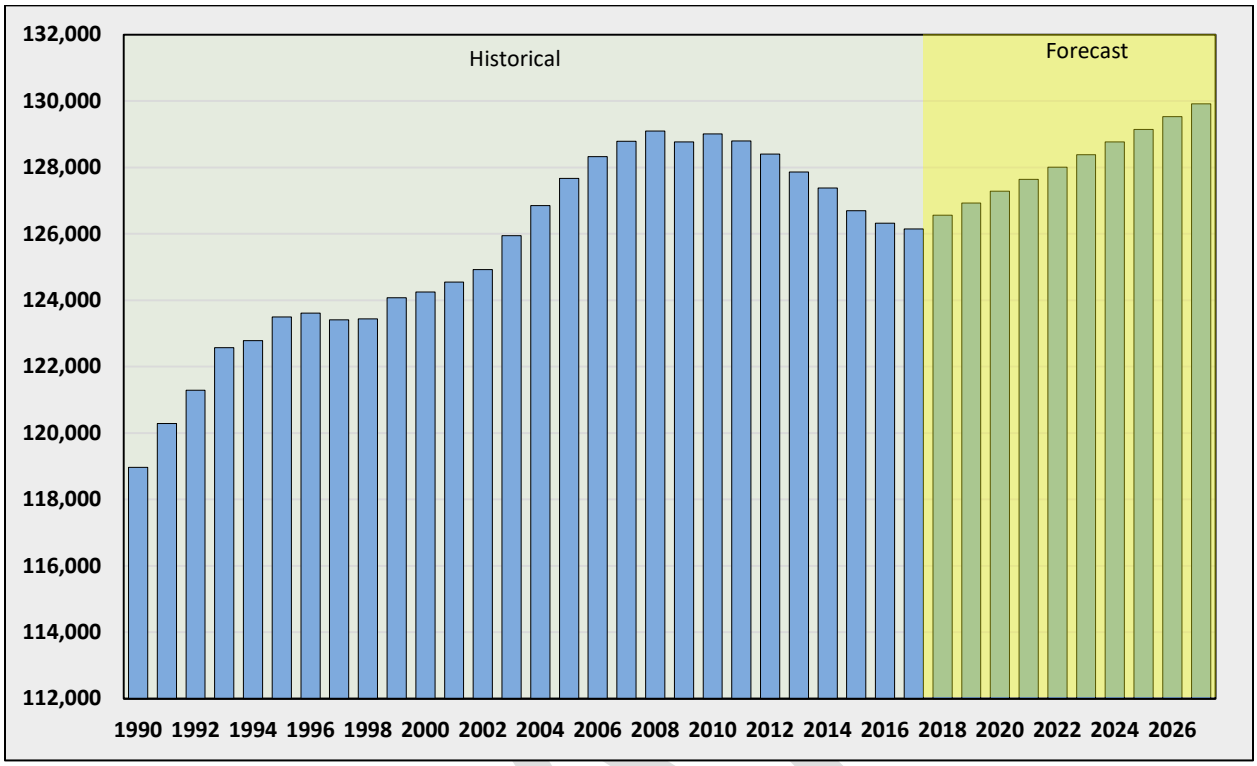


Figure 2.3: Glens Falls MSA–Historical (1990–2017)/Moody's Analytics Baseline Forecast (2018 – 2027)



Creating a Unique Forecast Model for Glens Falls MSA Region and Town of Queensbury

Figures 2.4 (and 2.5) sets forth graphically the components of population change which were included in the regional economic and demographic forecast baseline for the MSA region and for the Town.

From the chart, it seems apparent that net migration has played a prominent role in overall population change. Strong economic growth in the early 2000s drove in-migration to the MSA region. The Great Recession led to slower economic growth, and which ultimately resulted in out-migration from 2011 through 2016. Data for 2017 shows modest in-migration, indicating the trend may be shifting again. Similar to net migration, the natural change (births minus deaths) was showing consistent growth from 2000 to 2008, but following the Great Recession the natural change shifted to the point where the number of deaths outpaced births. The Moody's Analytics regional baseline forecast expects a more modest decline in that natural change from 2018 to 2027, although it still follows the same overall downward trend for the natural change in population and faster growth from in-migration, as shown set forth in Figure 2.6.

Figure 2.4: Net Migration and Natural Increase in Population – Glens Falls MSA 2001 – 2017

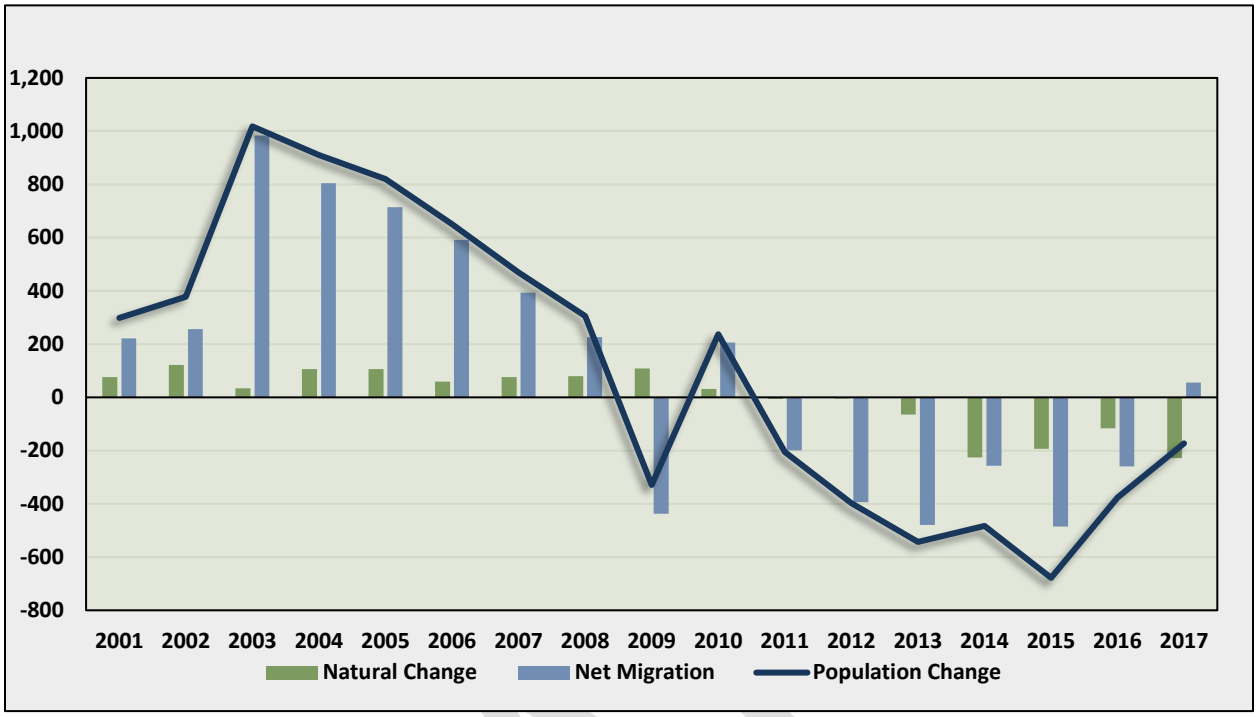


Figure 2.5. Net Migration and Natural Increase in Population—Town of Queensbury 2001-2017

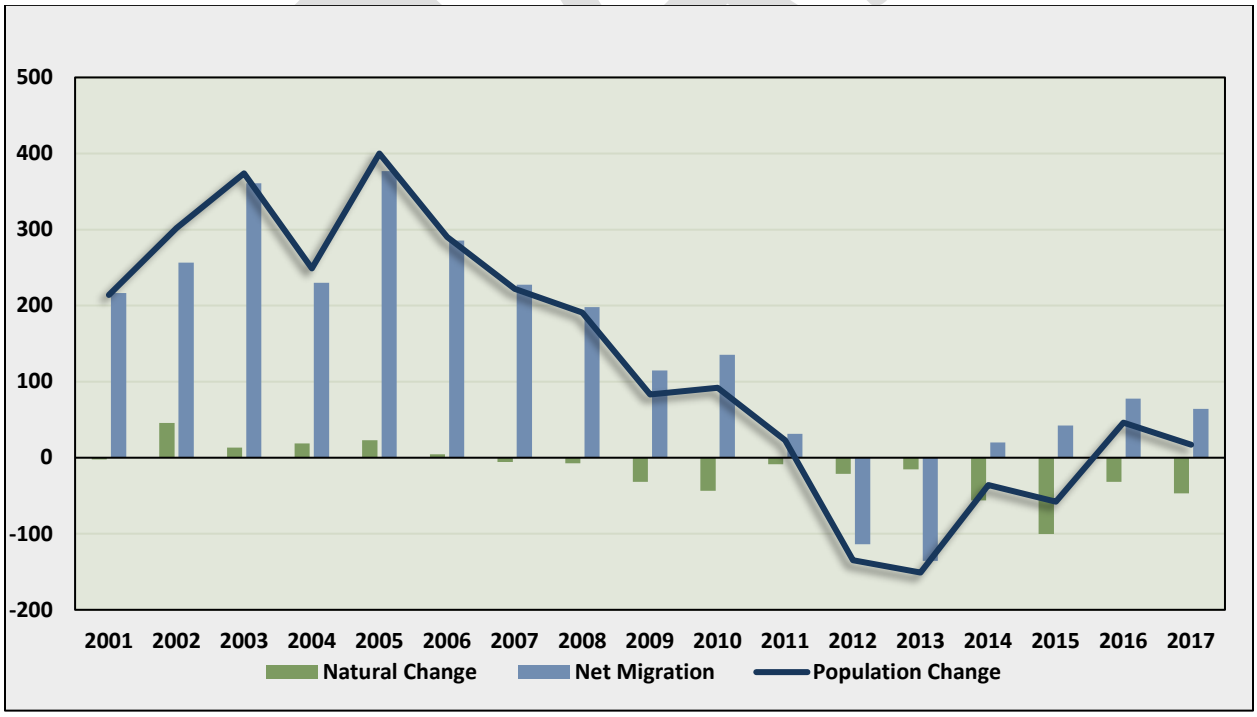
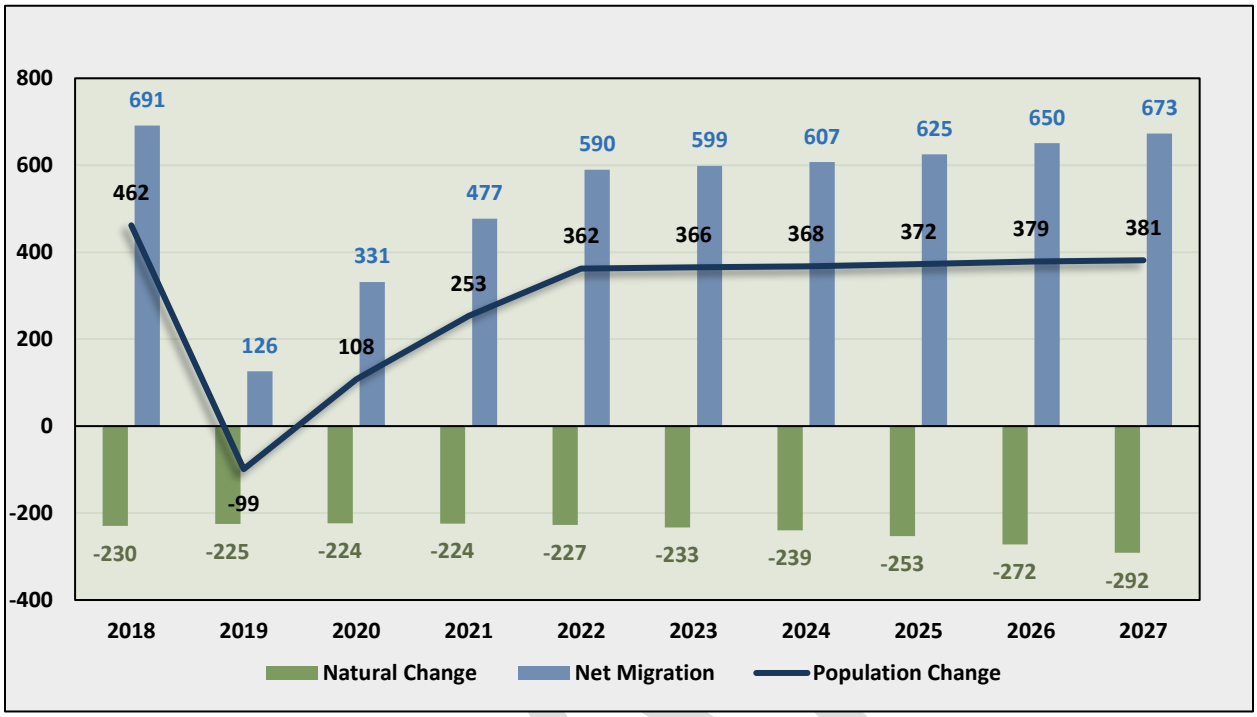


Figure 2.6: Moody's Analytics/EPR-Crane Associates Team Baseline Forecast of Net Migration and Natural Population Change–Glens Falls MSA



The initial adjusted forecast had a large increase in population in the first forecasted year. This was likely caused by the Moody's forecast not incorporating certain important characteristics of the MSA (it is impossible to know which ones), and it reflected a typical "forecast launching" issue—where historical values are matched to forecasted future values as estimated by the quantitative model. In order to properly address this issue—in terms of the change in population from 2017 (last year of region historical data) to 2018 (first year of forecasted region data[13]) a statistical adjustment to the Moody's forecast was made to weight the previous years' demographic trends a little more heavily.

To accomplish this, a 5-year moving average was applied to the Moody's Analytics baseline data, where the value in 2018 was the 5-year average of the total population in the MSA from 2014 through 2018. Instead of 2027's population forecasted to be 129,917 in the original Moody's forecast, the adjusted population would now be 129,104. This approach resolves the forecast's launching problem and the 5-year moving average application to years 2018 through 2027 in the Moody's Analytics baseline regional forecast completes the adjusted forecast. Forecasting based on a VAR (Vector Autoregression) produces a lower regional population forecast than what Moody's Analytics forecasted in the regional population forecast baseline. To further revise, again based on the inclination to give consideration to demographic trends, we took into account the forecasted natural change of population by Moody's Analytics for years 2017 through 2027. We subtracted the forecasted number of deaths (net of births) in the MSA during these years from the results obtained from the forecast based on the VAR above. This lowered the EPR

forecast for population even further away from the Moody's Analytics forecast. Figure 2.7 below shows the difference between EPR's revised forecast and Moody's regional baseline forecast.

Figure 2.7: Glens Falls MSA Population Forecast – EPR Adjusted Forecast for Glens Falls MSA (Green) vs the Moody's Analytics Baseline Population Forecast for Glens Falls MSA (Gray)