

Socio-economic Forecasting: Achieving Greater Precision

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TDM Precision

- A Travel Demand Model Is As Good As Its Inputs
- “Garbage In Garbage Out (GIGO)”

- Source (Johnson County MPO)

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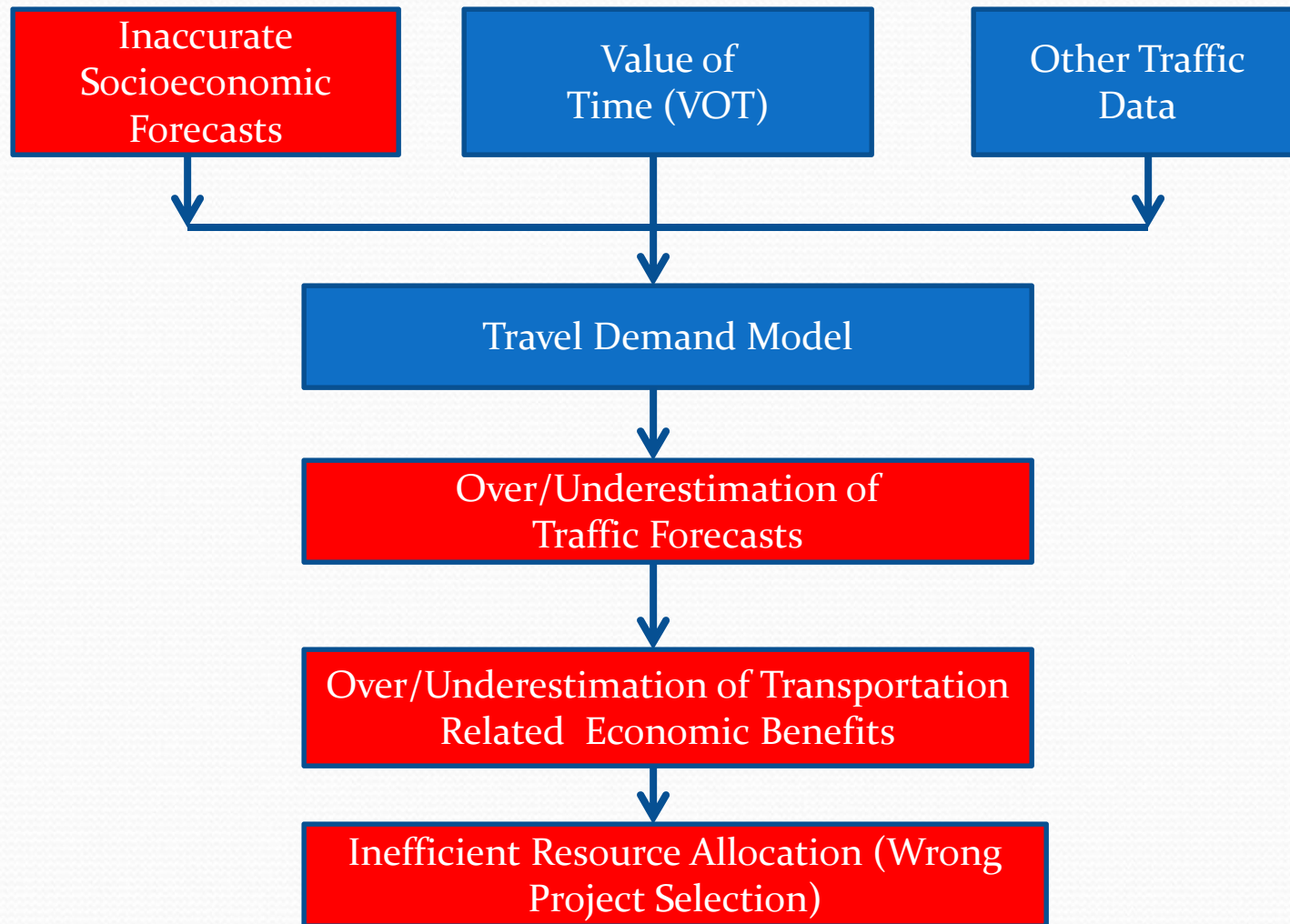
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"I tried to warn him -
garbage in, garbage out."

Importance of SE Data-Empirical Evidence

- Rodier (2003)
 - About of half of VMT overestimation from Sacramento, CA travel demand model was due to demographics and employment projections.
- Bain and Wilkins (2002)
 - VOT major sources of travel demand imperfection-use local/regional data source.
- Flyvberg et al. (2005 and 2006)
 - Forecasting more than 10 years out, land development patterns is a major source of error.

Effects of Inaccurate SE Data



GDOT's TDM SE Data Attributes

- Population
- Households
- Employment
 - Retail
 - Wholesale
 - Services
 - Manufacturing
- School Enrollment
- Median Income
- Land Use

SE Data Development

- Base Year (2010)
- Horizon Year (2040) – Current Plan Updates

- Major Steps
 - Control Total Estimation
 - Distribution of Control Total by TAZ

Socioeconomic Data – Base Year (2010)

Population, Housing & Income

- 2010 population housing data by Census block
- Sum Census block data to attain TAZ level data.
 - Adjust for non-travelling population
 - Nursing home resident
 - Correctional facility inmates
 - Adjust for dormitory group quarters
- Assign median income at tract level to TAZ level

Employment

- Use 2010 employment by industry data
 - Bureau of Economic Analysis
 - Bureau of Labor Statistics
- Employment distribution by TAZ
 - Establishment data
 - Geocode employers based on physical address
 - Identify major employers in the region
 - Distribute employment (by type) based on respective TAZ

School Enrollment & Land Use

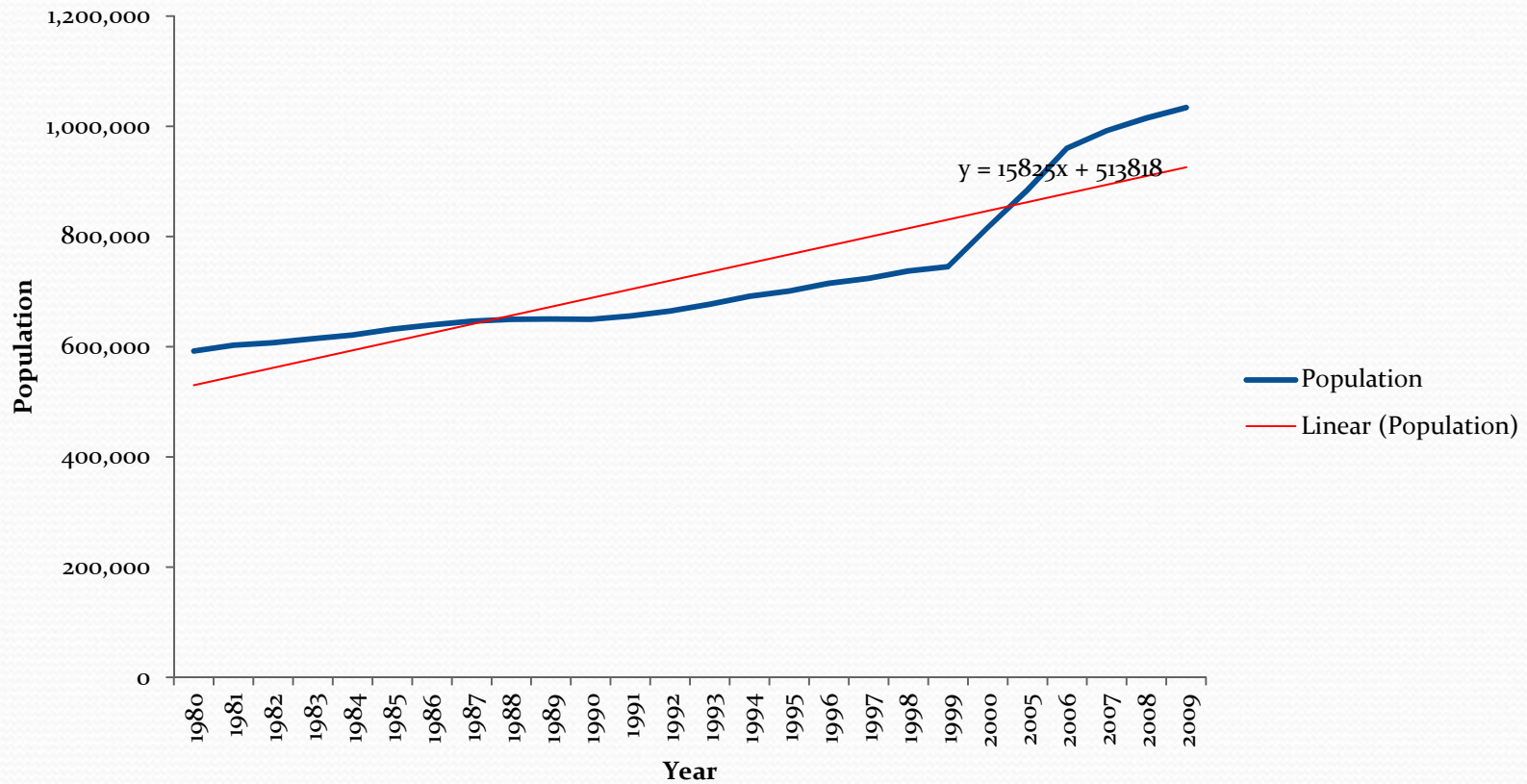
- School Enrollment
 - Collect schools data – enrollment & physical data (GDE, School Board & Schools)
 - Geocode schools based on physical addresses
 - Allocate school enrollment to respective TAZ.
- Acreage
 - Use GIS to estimate acreage

Socioeconomic Data – Horizon Year (2040)

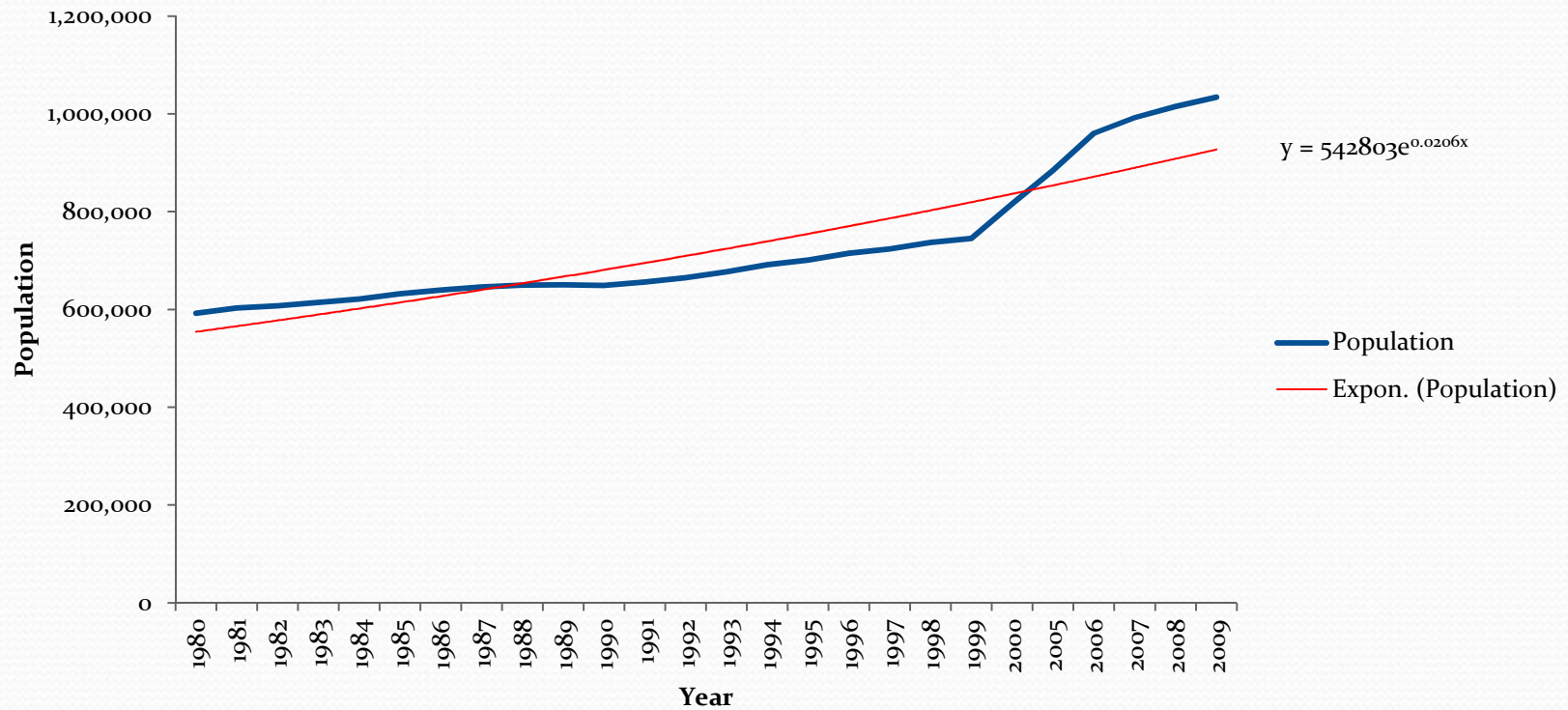
Population

- Establish control total.
- **Population – Various Approaches**
 - $P_{2040} = P_{2012} + \alpha \text{Births} - \beta \text{Deaths} \pm \text{Net Migration}$ (Time Series Forecasting)
 - $P_{2040} = P_{2012} + \text{Ave. PP} * N * \text{Household Growth} \pm \text{Net Migration}$
 - $P_{2040} = \text{Share of U.S Population in 2040}$
 - Private Sector Vendor: Woods & Poole
 - Public Sector Estimates: County (Comprehensive Plan), MPO etc.

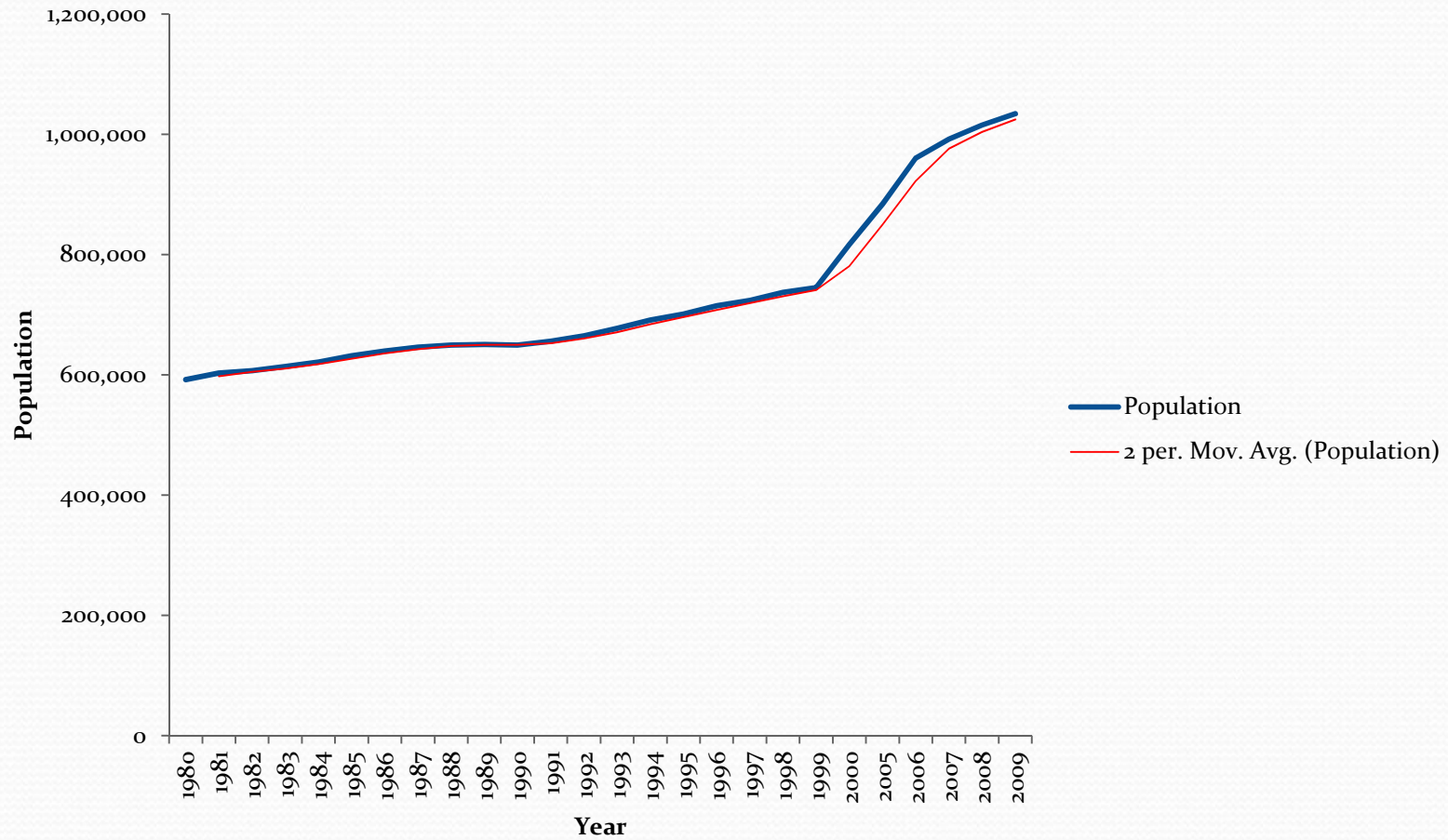
Linear Forecast



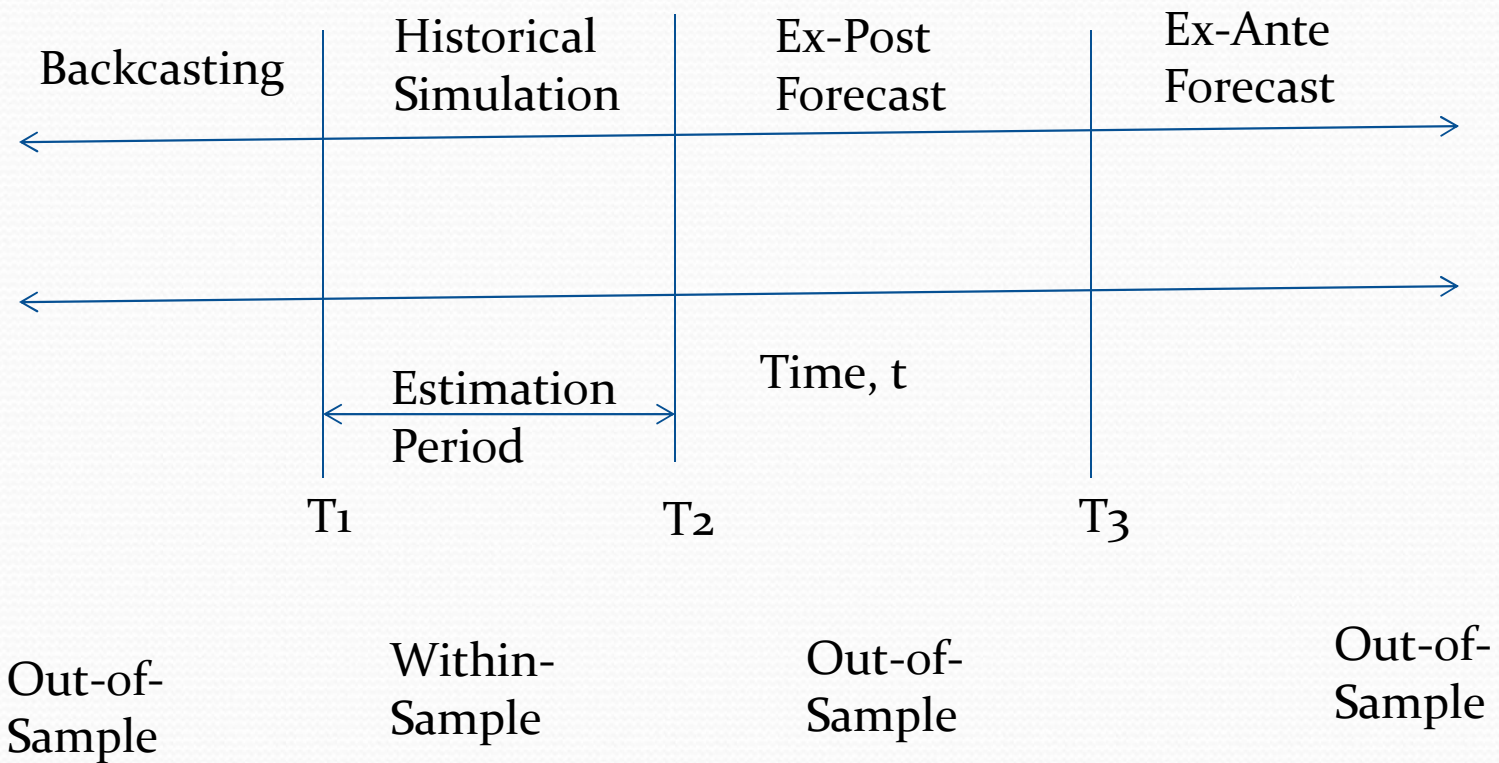
Exponential Forecast



Moving Average Forecast

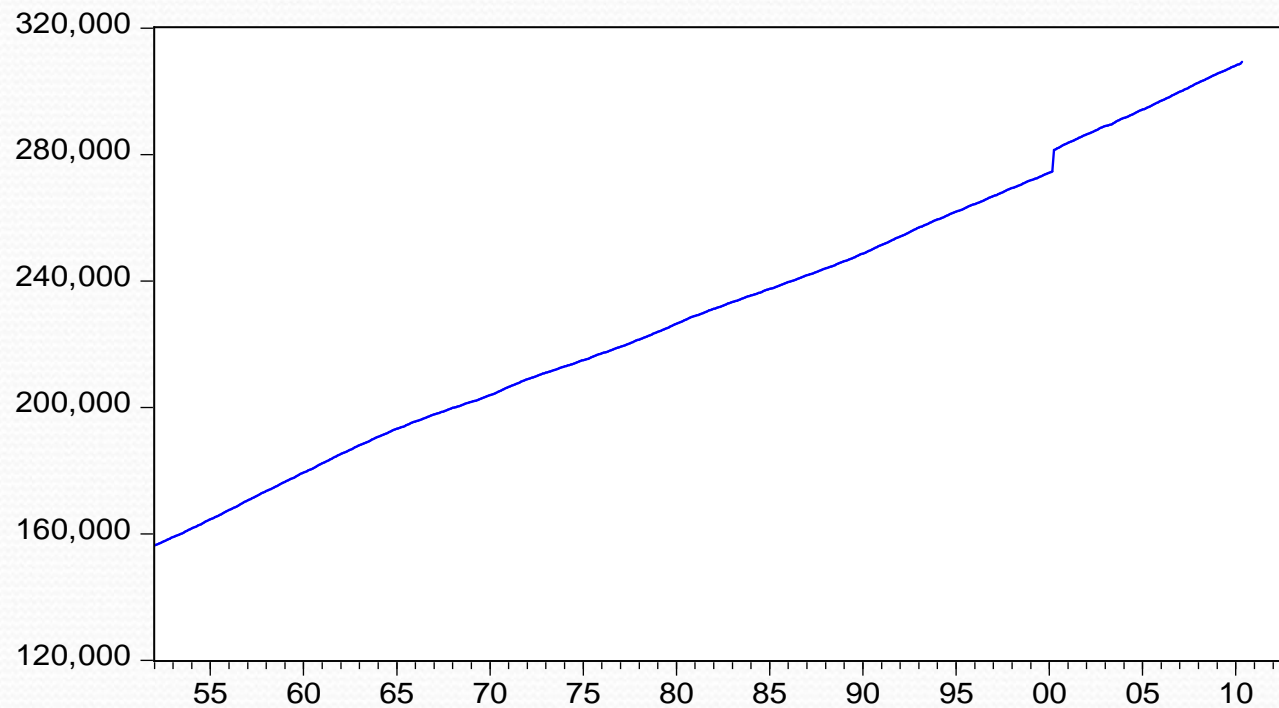


Forecasting – Approach

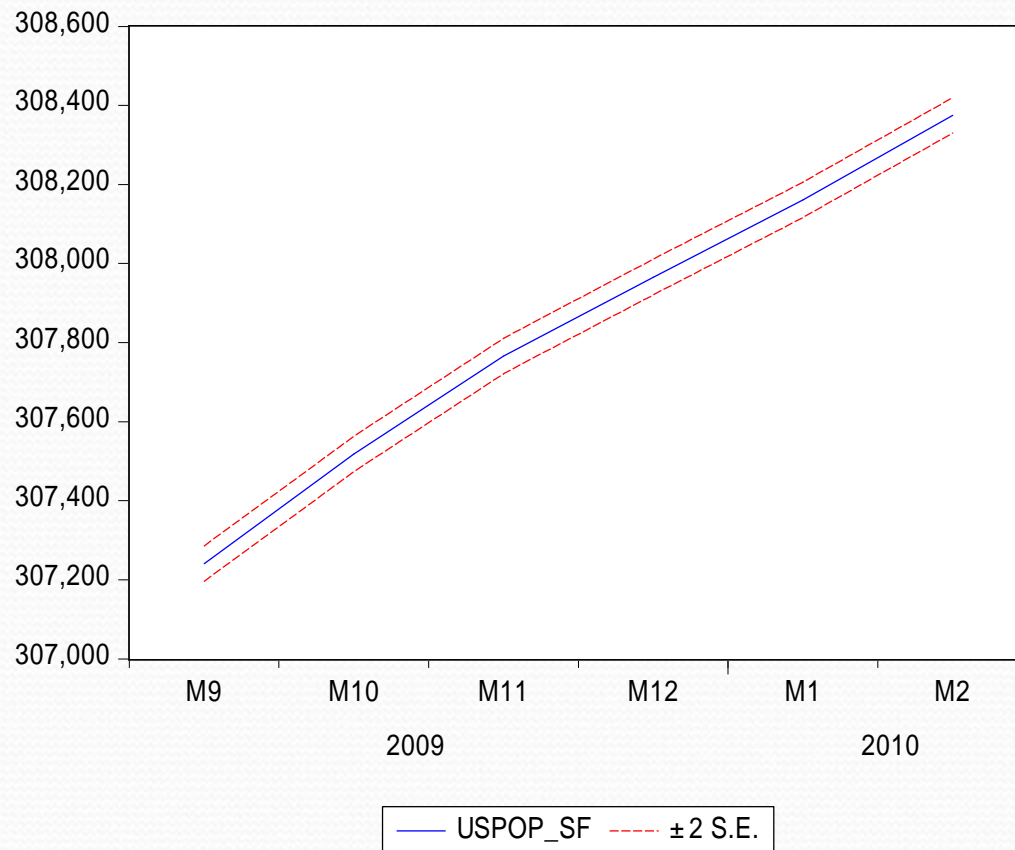


Historical U. S. Population

USPOP

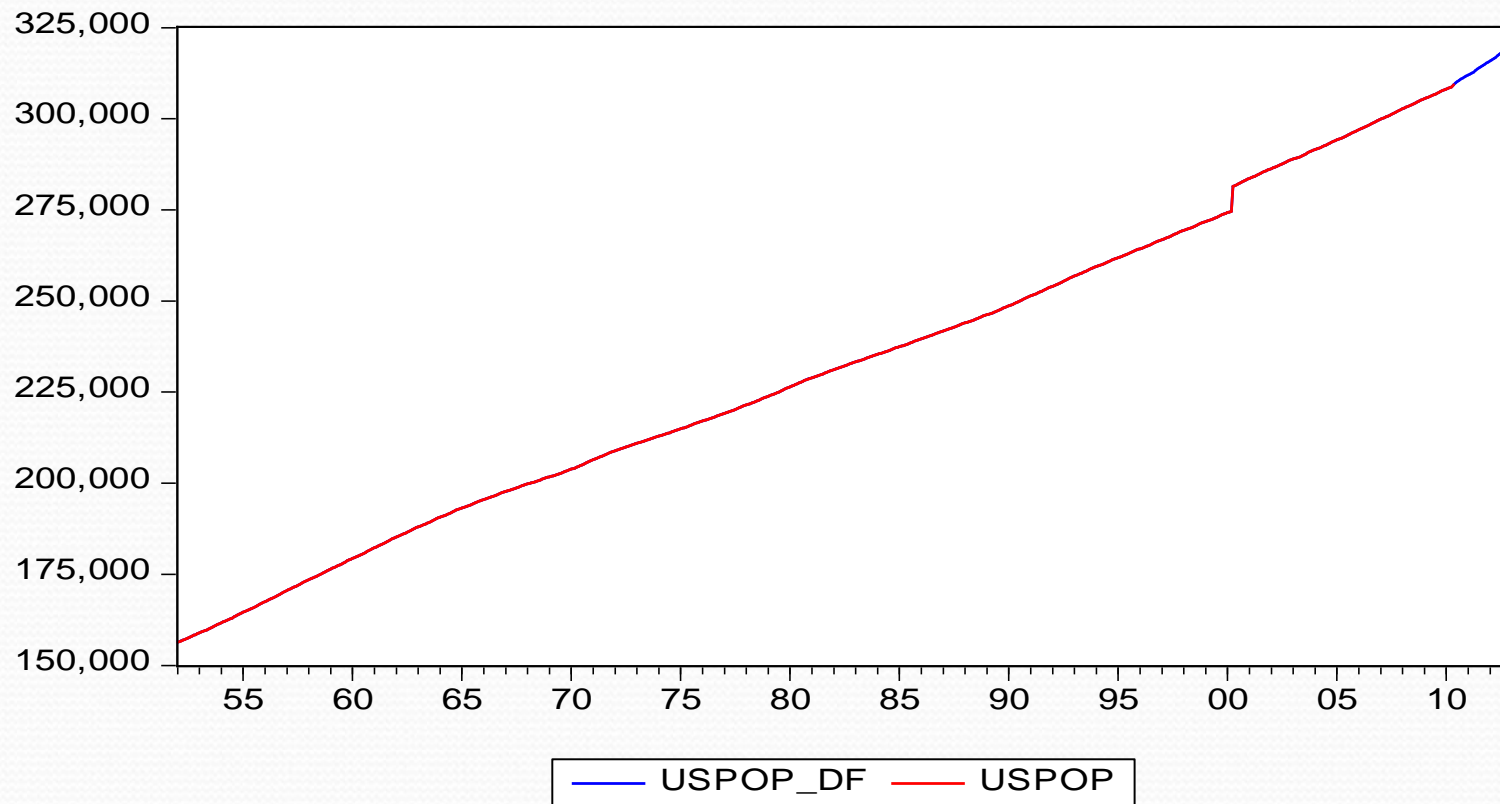


Population Model Test

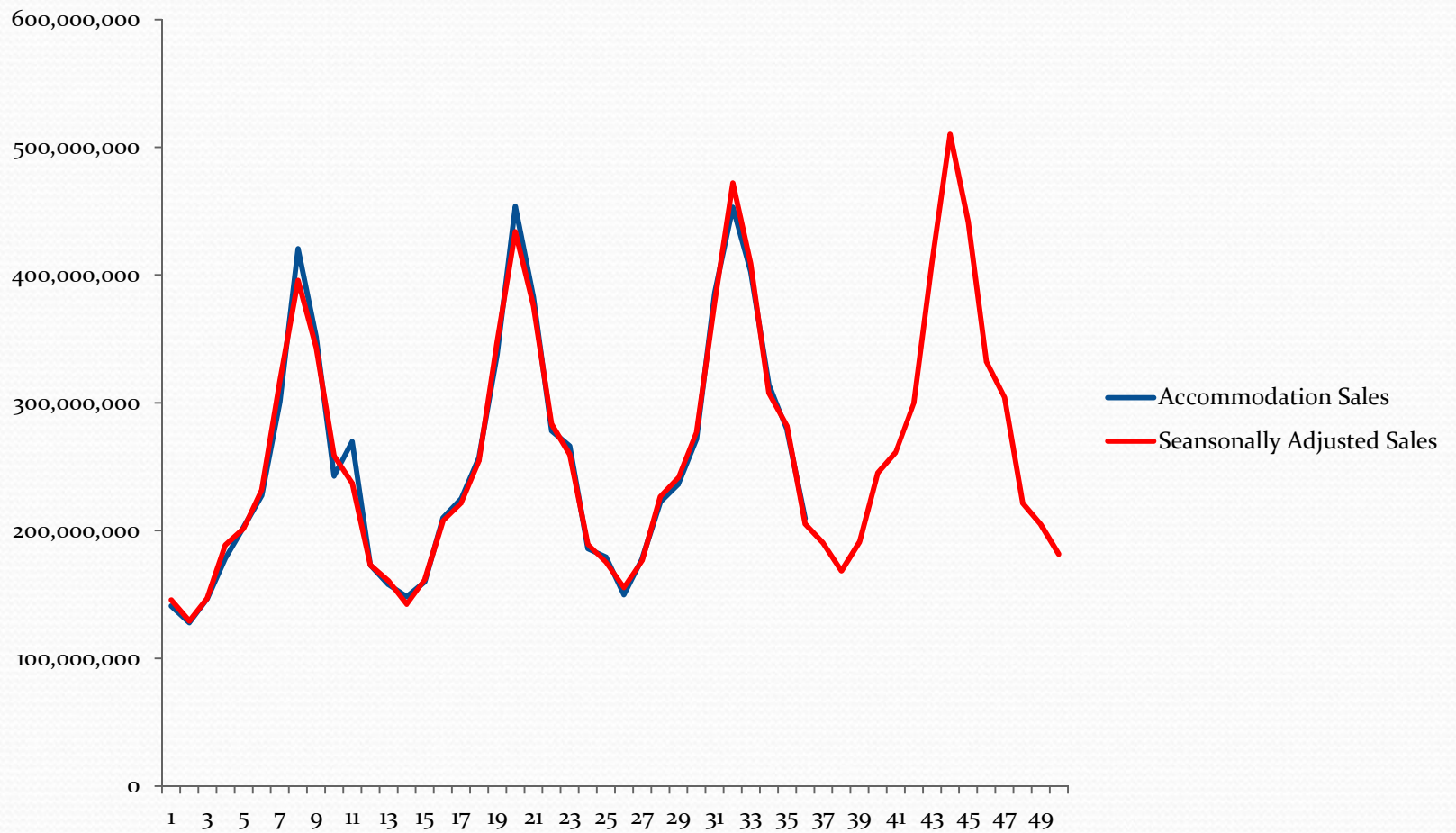


Forecast: USPOP_SF
Actual: USPOP
Forecast sample: 2009M09 2010M02
Included observations: 6
Root Mean Squared Error 13.18089
Mean Absolute Error 9.547016
Mean Abs. Percent Error 0.003103
Theil Inequality Coefficient 2.14E-05
Bias Proportion 0.050376
Variance Proportion 0.198710
Covariance Proportion 0.750914

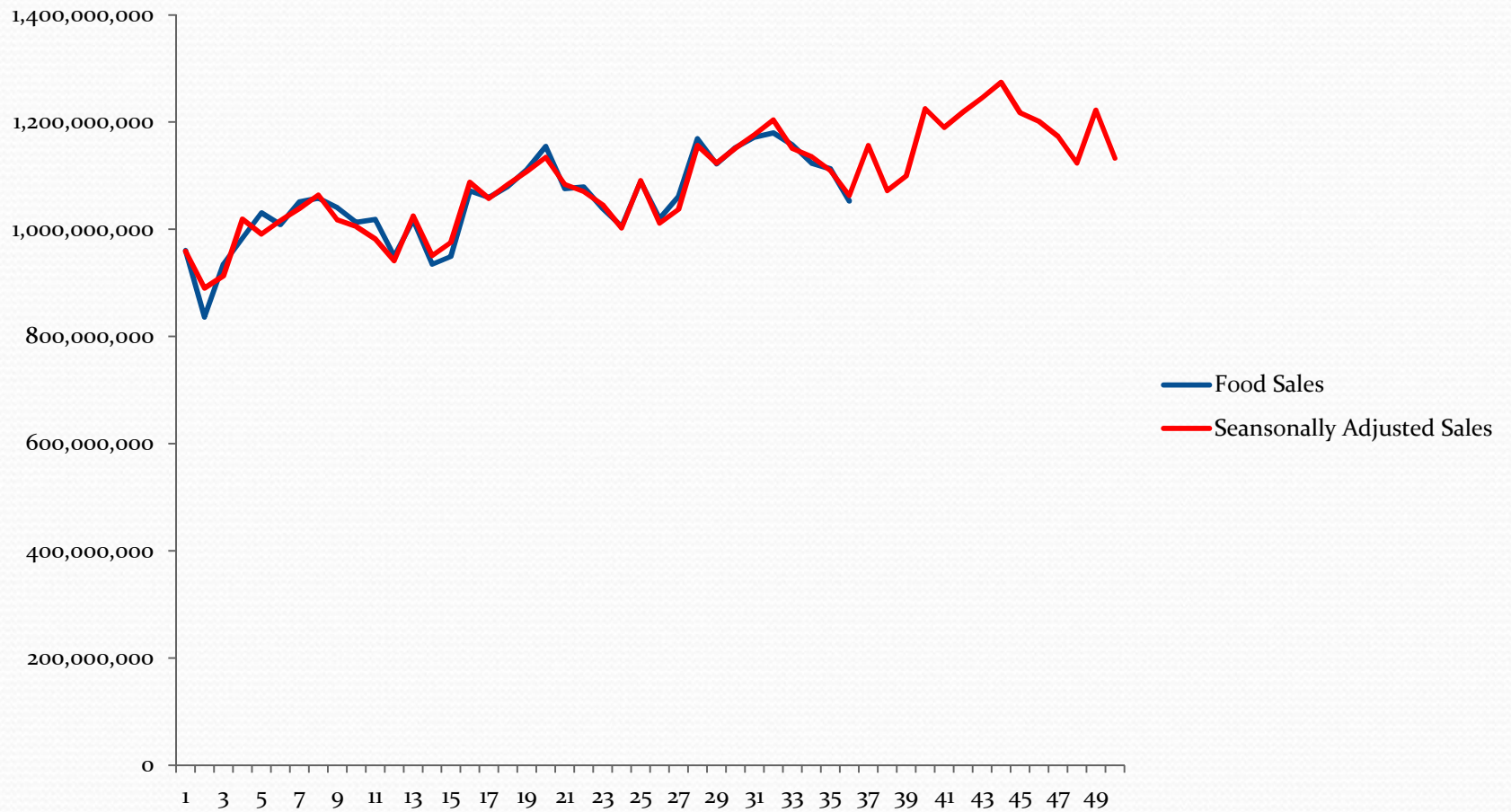
U.S. Population Forecast



Example: Revenue Forecast - Hotel



Example: Food Sales Forecast

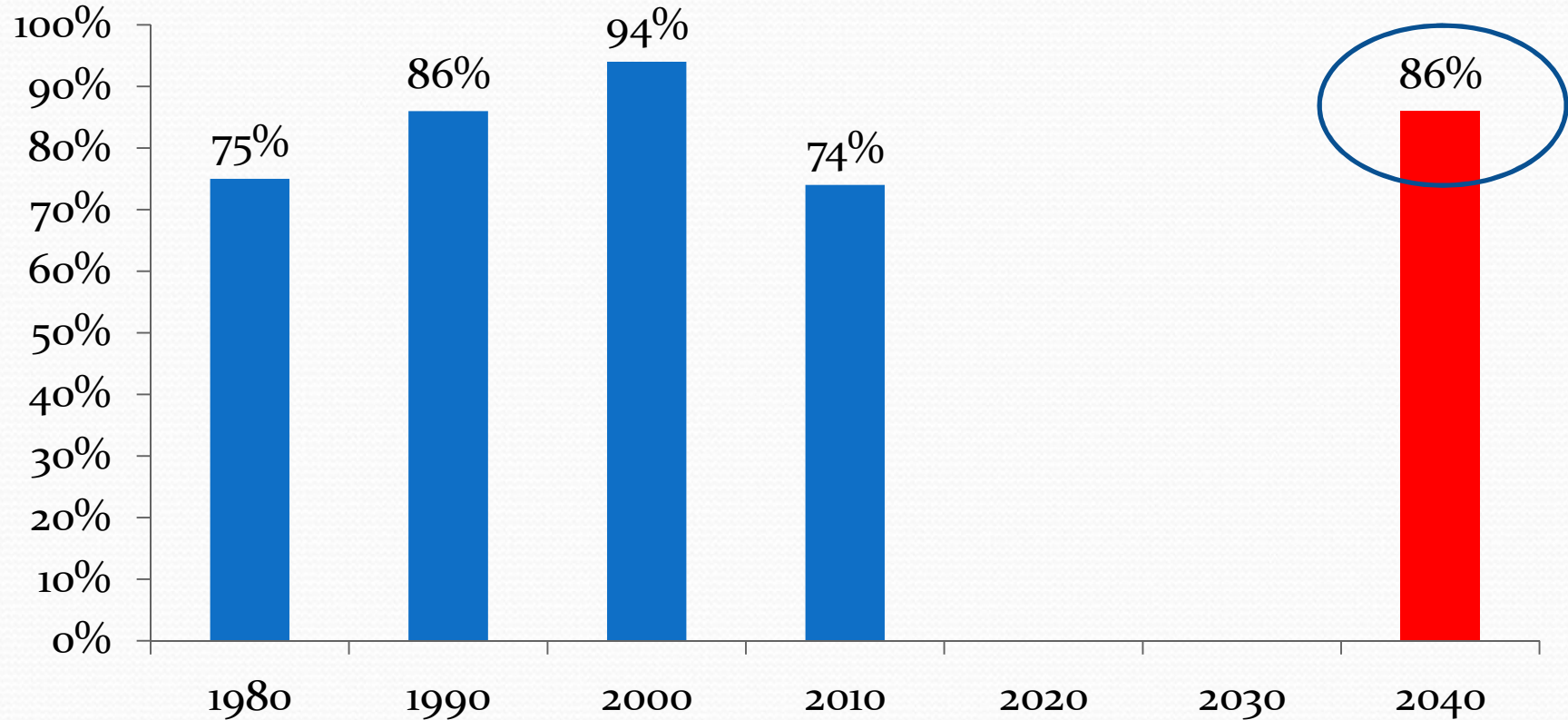


Employment Forecast

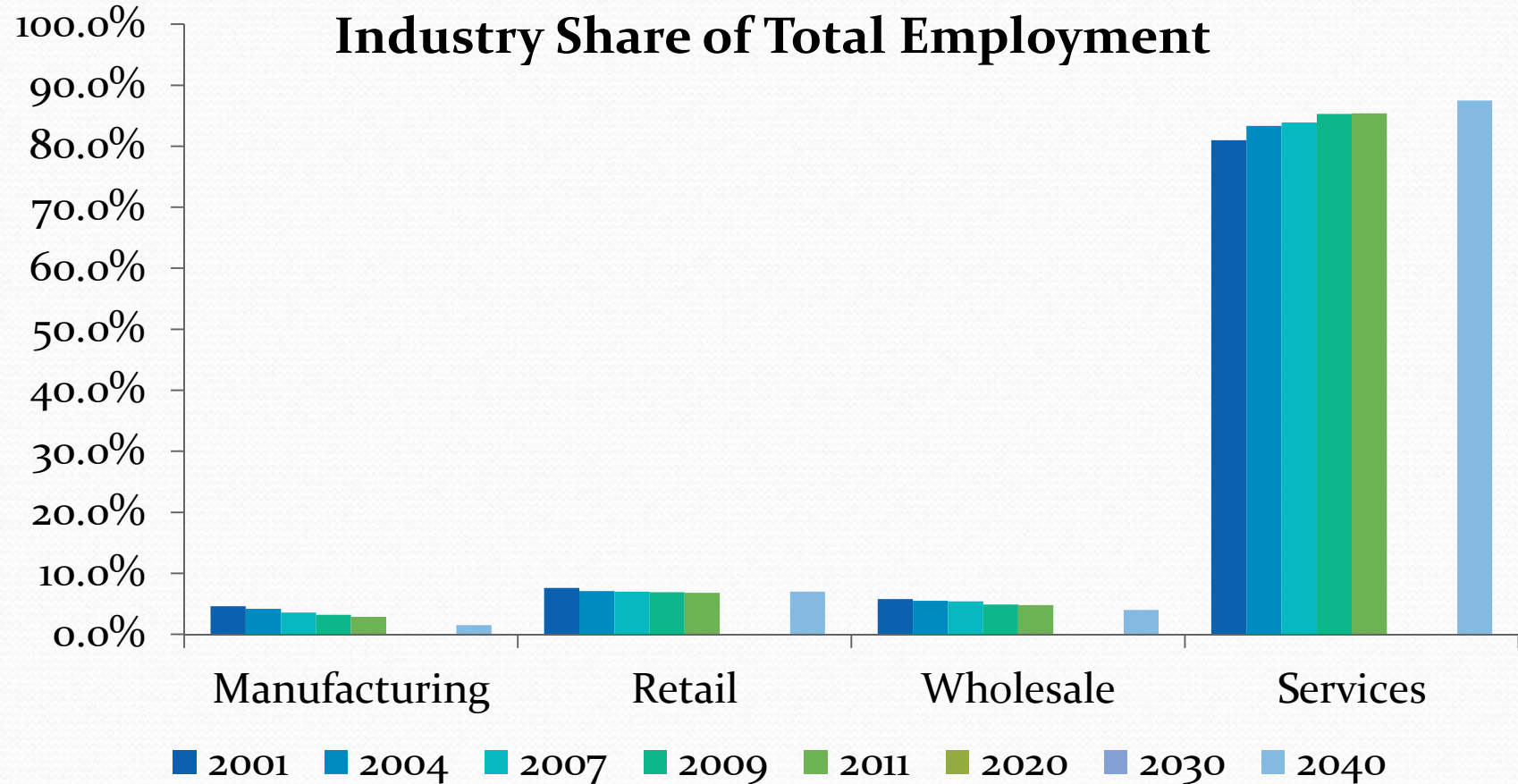
- Control Total
 - Benchmark Employment/Population Ratio
 - 2040 Projected Population
 - Employment Growth (2040 – 2010)
 - Adjustments for new investments (if any)
- Employment Distribution by TAZ
 - Economic Structure of Region
 - Growth Industries/Trend
 - Major Employers

Employment Share of Population

Employment Share of Population



Emp. Dist. by GDOT Employment Type



Employment Projection

Industry Share of Total Employment – Fulton County

Industry	2001	2004	2007	2009	2010	2011		2040
Manufacturing	4.6%	4.2%	3.6%	3.2%	3.0%	2.9%		1.5%
Retail	7.6%	7.1%	7.0%	6.9%	6.9%	6.8%		7.0%
Wholesale	5.8%	5.5%	5.4%	5.0%	4.9%	4.8%		4.0%
Services	82.0%	83.3%	83.9%	85.0%	85.3%	85.4%		87.5%

(Source: Bureau of Economic Analysis & Economic Decisions Group analysis)

Historical Data

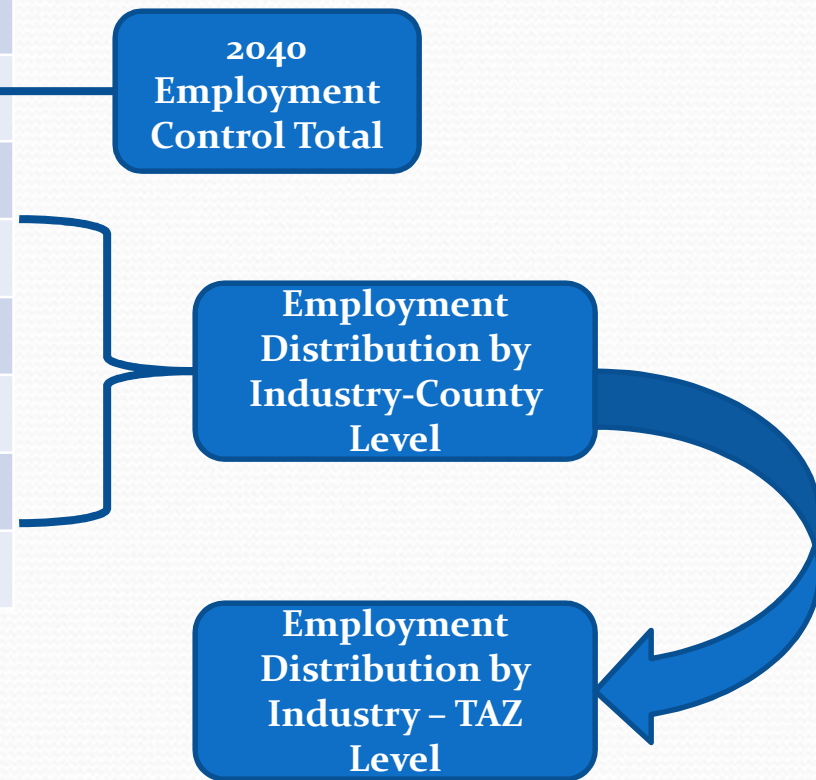
Forecast Data

- Forecast based on share of total employment pre, during, and post recession
- Forecast accounts shift in economic structure from manufacturing to services
- 2040 employment control total by employment type = total employment control (2040) x employment share
- Allocate employment type to TAZ based land use and expected growth in major employers

Employment Distribution by Industry



	2010	2040	2040-2010
Population		1,329,897	
Fulton County Employment	768,516	1,130,412	361,896
Emp./Pop	74%	86%	
Manufacturing		1.5%	5,428
Retail		7.0%	25,333
Wholesale		4.0%	14,476
Services		87.5%	316,659



Allocate each employment type to TAZ based on land use (comprehensive plan) and growth of major employers

Land Use

- Comprehensive Plan
 - Restricted Land
 - Infrastructure Development
 - Housing Development: Permit Approvals, Demolitions
 - Business Attraction
 - Competitiveness to Attract Businesses
 - Site selection factors
 - Quality of life factors (crime, education, health facilities, etc.)

Households

- Control Total
- 2040 Projected Households
 - Median Persons Per Household (2010)
 - 2040 Projected Population
 - Share of Housing Type (2010)
- Housing Distribution by TAZ
 - Land Use (Comprehensive Plan)
 - Permit Approval
 - Demolitions
 - Infrastructure Development

Median Household Income Projection



- Estimate 2040 wage by employment type
 - Adjusted 2010 median wage to reflect inflation
 - Estimate Change in Industry income
 - Distribute income across household types
 - Estimate Weighted Median Household Income

School Enrollment Projection

- Employ population data by age cohort
 - Identify population within child bearing age cohort
 - Estimate 2010 enrollment ratio (enrollment/population by cohort).
 - Estimate enrollment control total
 - 2040 projected population x 2010 enrollment ratio (Assumption: enrollment growing in tandem with population), adjust for new schools
 - Estimate enrollment change = 2040 enrollment – 2010 enrollment
 - Allocate enrollment change to TAZ based on 2010 allocation methodology.

Population by Age Cohort



Q & A

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