TRIAD SE Data Forecasting: A Top-Down – Bottom-Up Approach

North Carolina Statewide Model Users’ Group

April 26th, 2006

Presentation by

Todd Steiss
of
Parsons Brinckerhoff
Top Down

County Level

Sub-Area Level Consensus

Parcel Level to TAZ

Bottom Up

County, Regional, & State Socioeconomic Forecasts

TAZ Level

Local/Regional Comprehensive Plans, Zoning, Land Use, Utilities, Transportation Plans
Nine Counties in Study Area

Stokes
Forsyth
Davie
Davidson
Randolph
Rockingham
Guilford
Alamance
Orange

Three Full and Six Partial
86 Sub Areas
1,670 TAZs
Top-Down Approach
Top-Down Approach
County Level

Total Population
2015, 2025, 2035

Total Employment
2015, 2025, 2035

County Level Data Sources

• Woods and Poole County Forecasts

• North Carolina State Data Center

• Local Land Use & Transportation Plans

• Previous Modeling Data
Top-Down Approach

General Steps

• Obtaining Regional, County, and Local Socioeconomic Forecasts from Public and Private Sources

• Comparing the Different SE Data Forecasts

• Review Underlying Assumptions and Methodologies

• Expand the Forecasts to Horizon Years (2015, 2025 & 2035)
Top-Down Approach

General Steps

• Interview Local Companies and Public Officials
  ➢ Derive Insights on Spatial Patterns of Future Growth

• Develop Adjustment Factors
  ➢ Make Forecasts Data Consistent with Triad Model V

Variable Definitions

• Developing Market Insight Factors
  ➢ Adjust Subarea-Level Growth Rates in Comparison to County-Level Growth Rates
Top-Down Approach
Sub-Area Level Data Sets

- Total Population
  - 2015, 2025, 2035

- Highway Retail Employment
  - 2015, 2025, 2035

- Retail Employment
  - 2015, 2025, 2035

- Industrial Employment
  - 2015, 2025, 2035

- Service Employment
  - 2015, 2025, 2035

- Office Employment
  - 2015, 2025, 2035
Bottom-Up Approach
Assigning TAZs to Land Parcels

• Total Number of Parcels: Approximately 1,000,000

• Overlaid TAZ boundaries over land parcels using GIS

• Assigned TAZ numbers to parcels based on “best-fit” methodology

• Review all TAZs based on best-fit results
TAZ Assignment to Land Parcels
Example Requiring Minor Adjustments
Identifying Vacant and Developed Property

Assessors Records: Several Hundred Data Fields of Information

Example of Variables Used

<table>
<thead>
<tr>
<th>Property Value</th>
<th>Property Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Total Value</td>
<td>Land Use Code</td>
</tr>
<tr>
<td>Building Value</td>
<td>Units in Structure</td>
</tr>
<tr>
<td>Other Structures Value</td>
<td>Zoning</td>
</tr>
<tr>
<td>Total Value</td>
<td>Year Built</td>
</tr>
</tbody>
</table>
# Identifying Vacant and Developed Property

## No Single Source to Determine Property Status

<table>
<thead>
<tr>
<th>Vacant Land</th>
<th>Grey Area ???</th>
<th>Developed Land</th>
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<tr>
<td>Land Value = Total Value</td>
<td>Land Value = Total Value</td>
<td>Total Value &gt; Land Value</td>
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<tr>
<td>Land Use Code = Vacant</td>
<td>Land Use Code = Not Vacant</td>
<td>Land Use Code = Not Vacant</td>
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<tr>
<td>Total Units = 0</td>
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<tr>
<td>Year Built = Blank</td>
<td>Year Built = Blank</td>
<td>Year Built = Not Blank</td>
</tr>
</tbody>
</table>
Bottom-Up Approach
Step Three

Creating General Land Use Categories

Vacant Land
- Non-Residential
- Residential
  - Single Family
  - Multi-Family

Based on Zoning and Land Use Plans

Developed Land
- Non-Residential
- Residential
  - Single Family
  - Multi-Family

Residential Data
Compare/Validate using Census Data

Non-Res. Data
Compare/Validate using Info USA
Establish Build-Out and Growth Rates

- **Build-Out Estimates**
  - Housing Units Based on Zoning Minimum Requirements
  - Employment Based on Info USA Sampling and Zoning

- **Growth Rates**
  - Housing Units Based on 1990-2000 Census at TAZ Level
  - Employment Based on Development Patterns (Year Built)
# Bottom-Up Build-Out Analysis

## Housing Unit Density Look-Up Table (Example)

<table>
<thead>
<tr>
<th>Zoning</th>
<th>Density</th>
<th>Units</th>
<th>Zoning</th>
<th>Density</th>
<th>Units</th>
<th>Zoning</th>
<th>Density</th>
<th>Units</th>
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<tbody>
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<td>SqFt/Unit</td>
<td>RS40</td>
<td>40000</td>
<td>SqFt/Unit</td>
<td>RM12-S</td>
<td>12</td>
<td>Units/Acre</td>
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<tr>
<td>AG-S</td>
<td>40000</td>
<td>SqFt/Unit</td>
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<td>SqFt/Unit</td>
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<td>MH</td>
<td>10000</td>
<td>SqFt/Unit</td>
<td>RS7</td>
<td>7000</td>
<td>SqFt/Unit</td>
<td>RM18 HO</td>
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<td>Units/Acre</td>
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<tr>
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<td>RS7-S</td>
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<td>SqFt/Unit</td>
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<tr>
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<td>RS9</td>
<td>9000</td>
<td>SqFt/Unit</td>
<td>RM18-S HO</td>
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<td>Units/Acre</td>
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<tr>
<td>RS12-S</td>
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<tr>
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<td>RMU-S</td>
<td>20</td>
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</table>
## Bottom-Up Build-Out Analysis

### Employment Density Look-Up Table (Example)

<table>
<thead>
<tr>
<th>Zoning</th>
<th>Density</th>
<th>Units</th>
<th>Zoning</th>
<th>Density</th>
<th>Units</th>
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<th>Density</th>
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<tbody>
<tr>
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<td>0</td>
<td>SqFt/Emp</td>
<td>H</td>
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<td>SqFt/Emp</td>
<td>LO HO</td>
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<td>SqFt/Emp</td>
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<tr>
<td>C</td>
<td>2800</td>
<td>SqFt/Emp</td>
<td>HB</td>
<td>1600</td>
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<td>LO-S</td>
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<td>SqFt/Emp</td>
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<td>LI KING</td>
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<td>LI-S</td>
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<td>SqFt/Emp</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Bottom-Up Growth Rate Analysis

Growth Rates

- **Housing Units**
  - 1990-2000 Census at TAZ Level
  - Default 1 Unit per 10 Years

- **Employment**
  - Development Patterns (Year Built)
  - TranPlan 2000 – 2025 Growth
  - County Level 2002 – 2035 Growth
  - Long-Term 200 Year Growth
  - Default 1 Employee per 10 Years
2002-2035 Additional Employment

2035 Employment Additional Employment

- 0
- 1 - 50
- 51 - 100
- 101 - 150
- 151 - 1500

Forsyth County
Top Down Bottom Up First Draft

Added Population 2002-2035

Forsyth County

1476
5237

1372
3386

7061
9506

29761
7995

28351
16919

11897
15906

12719
16385

4888
5352

3332
2852

3589
3381

6741
4070

8313
13361

3818
8022

15669
19701

1040
2962

Italic: Top Down
Bold: Bottom Up
Forecast Spreadsheet
Spreadsheet Data Levels

County Level

Sub Area Level

TAZ Level
County Control Totals

- Total Population 2002, 2015, 2025, 2035
- Households 2002, 2015, 2025, 2035
- Total Employment 2002, 2015, 2025, 2035
- Household Autos 2002, 2015, 2025, 2035
- Primary Students 2002, 2015, 2025, 2035
Household/Population
Sub Area Control Totals And Calculations

- Total Population 2002, 2015, 2025, 2035
- Group Quarters Pop 2002, 2015, 2025, 2035
- Household Population 2015, 2025, 2035
- Household Population 2002
- Households 2002
- County Control Households 2015, 2025, 2035
- Final Households 2015, 2025, 2035
- Draft Households 2015, 2025, 2035
- Population/Household Ratio 2002
Employment
Sub Area Control Totals And Calculations

- Highway Retail Employment 2002, 2015, 2025, 2035
- Industrial Employment 2002, 2015, 2025, 2035
- Retail Employment 2002, 2015, 2025, 2035
- Service Employment 2002, 2015, 2025, 2035
- Office Employment 2002, 2015, 2025, 2035
- School Employment 2002, 2015, 2025, 2035

Total Employment 2002, 2015, 2025, 2035
TAZ Base Year Data

2000
- Total Population
- Group Quarters Population
- Households
- Occupied Housing Units
- Vacant Housing Units

2002
- Total Population
- Group Quarters Population
- Households

2002
- Highway Retail Emp
- Industrial Emp
- Retail Emp
- Service Emp
- Office Emp
- School Emp
- Primary School Emp
- University Emp

2002
- Primary Stu
- Full-Time University Stu
- Part-Time University Stu
- Total University Stu
- Total Full-Time Stu
- Total Part-Time Stu
TAZ Input Variables

**Housing Growth Variables**
- 1990 Census Housing Units
- 2000 Census Housing Units

**Housing Unit Build-Out**
- Vacant Land Additional Units
- Developed Land Additional Units
- Total Additional Units
- Override Unit Adjustment

**Growth Rate Adjustment Factors**
- Growth Area
- Activity Center
- Highway
- Transit
- Utilities
- Override Rate Adjustment

**Employment Growth Variables**
- 2000 TranPlan Employment
- 2025 TranPlan Employment
- 1990 Year Built Employment
- 2002 Year Built Employment

**Employment Build-Out**
- Total Additional Employment
- Override Employment Adjustment

**Household Autos**
- 2000 Autos per Household
- 2000 Household Autos

**School Enrollment**
- School Phasing: 2015, 2025, 2035
- School Size: Small, Medium, Large

---

1 From Bottom-Up Analysis  
2 From Auto Availability Analysis  
3 From School Enrollment Analysis
Analysis External To Spreadsheet
Household Autos Analysis

1990, 2000 Census
Autos per Driver
Trend by County

Driving Age Forecast
By County *
2015, 2025, 2035

Autos per Driver
Trend by County
2015, 2025, 2035

Household Autos
By County
2015, 2025, 2035

* From State Data Center. 2035 Interpolated. Adjusted to county control totals.
Autos per Household Analysis

Autos per Driver Trend

Driving Age Trend

Household Autos Trend
Primary Student Analysis

* From State Data Center. 2035 Interpolated. Adjusted to county control totals.
## Primary Student Analysis

### New Student Distribution

(Example)

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
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<tr>
<td>500 – 1000</td>
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</tbody>
</table>
Primary Student Analysis

New School Distribution
School Size Range

- 1 - 500
- 501 - 1000
- 1001 - 3121

1 Dot = 10
- Population Growth
Lessons Learned

• **Know the Definitions Being Used in Employment**

  ▪ The NC ESC reports INSURED employment: Does not include agricultural workers, the military, proprietors, household, and miscellaneous employment.

  ▪ BEA data (and W&P) includes employment not reported by BLS.
Lessons Learned

• Use Census Geography to Define TAZs
  ▪ Makes Comparison of Block Level Census Data Possible
  ▪ Makes it Easier to Relate Block Group Level Census Data to TAZs (Example: Household Income, Autos Available)
  ▪ TAZs Can be Used as Geography for the Census Transportation Planning Package (lots of census data at the TAZ level including commuter flows)
TRIAD SE Data Forecasting:
A Top-Down – Bottom-Up Approach

North Carolina Statewide Model Users’ Group

April 26th, 2006

Presentation by

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of
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Base Year Data Review

Main Concerns

• Vacant Units Included in Household Count

• Group Quarters Population Omitted

• Data Entry Errors/Other Flags

• Assignment of Census Blocks to TAZs
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
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<td>218</td>
<td>28</td>
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## Group Quarters Population Omitted

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### Assignment of Census Blocks to TAZs

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Assignment of Census Blocks to TAZs
Review Final Forecasts
## Population Adjustments By County

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