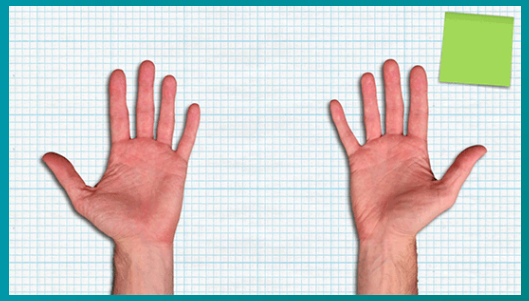
Enrollment Projections: Techniques and Applications

presented to the Southeastern Association for Community College Research

February 27, 2018

by
Vinnie Maruggi
Chesapeake College



Today's Presentation

- Projections Time Frames
- Considerations, Methodology & Options
- Applications

Enrollment Projections Time Frames

Potential Enrollment Projections Applications

- Long Term – 10+ Years
  - Principal application is for strategic program and facilities planning
    - Facilities Planning
      - Buildings, labs, etc.
    - Curriculum Planning
      - Program Enrollment vs. Employment Demand
    - Human Resources Planning
      - Faculty
  - Consequence of inaccuracy: Low to Moderate

Potential Enrollment Projections Applications

- Intermediate Term – 5 Years
  - Principal application is for operational and tactical planning
    - Curriculum, Facilities, and Human Resources
      - Enrollment by program
        - Faculty
        - Learning Spaces
        - Equipment
  - Consequence of inaccuracy: Moderate

Potential Enrollment Projections Applications

- Short Term – 1-2 Years
  - Principal application is for immediate planning
    - Budgeting
    - Scheduling
    - Recruitment
  - Consequence of inaccuracy: ***HIGH***

Enrollment Projections Considerations, Methodology & Options

Enrollment Projections Methodology

- Determine Relevant Student Population
- Determine Technical Approach
- Determine Projection Series
- Acquire Data
- Perform Analysis
- Identify Model Alternatives
- Finalize Model
- Compare Results
- Follow-Up/Improve

Enrollment Projections Methodology
Determine Student Population

- All Students
- Credit/Noncredit
- Unique target market segments
  - Those affected by distinctly different sets of internal and/or external drivers
  - Possible Alternatives
    - Residence
    - Student Demographics
    - Academic Life Cycle Stage
    - Course-Taking Patterns/ Majors
    - Combinations
      - Must be mutually exclusive & collectively exhaustive

Enrollment Projections Methodology
Alternative Student Population Subgroups

- **Student Age (4)**
  - Under 18 years
  - 18-19 years
  - 20-24 years
  - 25 years and over

- **Student Type (8)**
  - New Dual Enrolled
  - New Freshmen
  - New Transfers
  - Continuing Former Duals
  - Continuing Former Freshmen
  - Continuing Former New Transfers
  - Continuing Former Continuing
  - Returning (after break)

Enrollment Projections Methodology
Determine Projection Series

- Actual Enrollment
  - Number of students in each category
- Penetration Rates
  - Percent of the population groups enrolled
    - % of region population 20-24 years of age
- Level (easier) or Changes (harder)
  - If can model change, can model level

Technical Approach Options

Judgmental

- Expert Opinion

Extrapolation

- Linear, exponential, logarithmic, etc.

Cohort Tracking

- % of freshmen retained to sophomores, etc.
  - Still need projections of new students at various entry points

Statistical Model

- E.g., regression or curve fit accounting for proven influences on enrollment or Student Tracking

Simultaneous Equation Model

- E.g., Series 2- or 3-stage least squares regressions accounting for interrelationships between dependent and independent variables

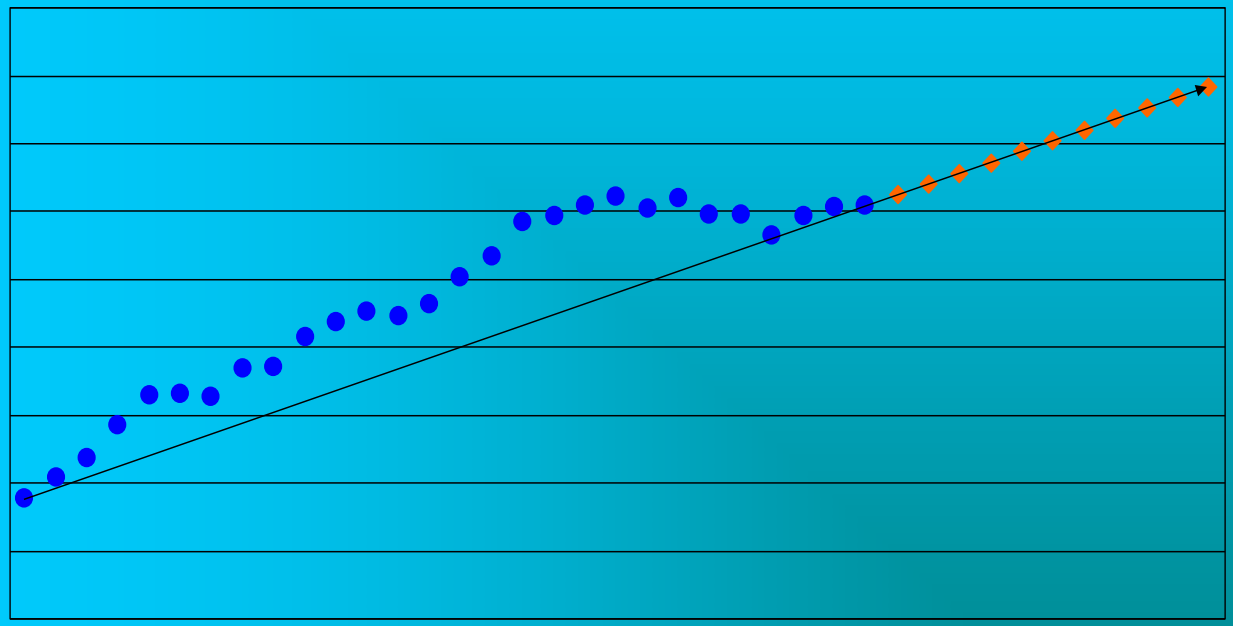
Hybrid Model

- Employ elements of more than one method

Enrollment Projections Methodology Judgmental

- “I think enrollment will grow by 2% next year”
- Advantages
- Disadvantages

Enrollment Projections Methodology Extrapolation



- Advantages
- Disadvantages

Enrollment Projections Methodology "Cohort" Tracking

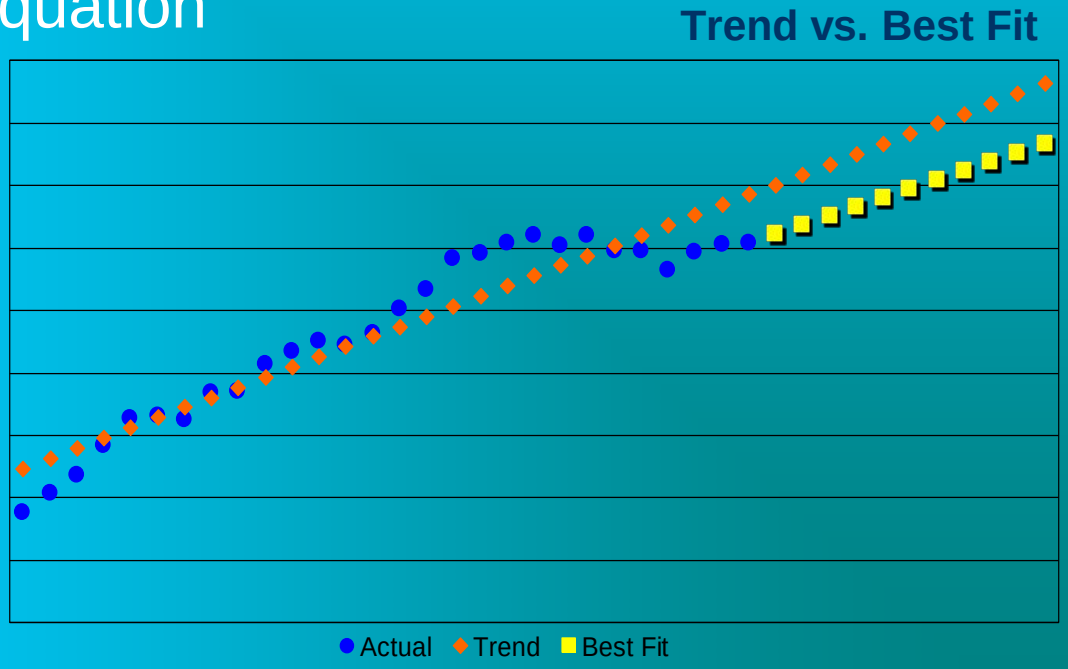
- What percent of students will return?
  - Freshmen
  - New Transfers
  - Dual Enrollees
  - Continuing Students
- How many new students will we get?
  - Freshmen
  - Transfers
  - Dual Enrollees
  - Returnees

- Advantages
- Disadvantages

Enrollment Projections Methodology Statistical Model

- Simple/Multiple Linear Regression
- Curve Fit
- Simultaneous Equation

- Advantages
- Disadvantages



Technical Approach Alternatives

Forecasting experts consider the most effective approach to be a blend of statistical modeling and informed judgment

- Statistical Modeling
  - Incorporates time series analysis that takes into account proven internal and external influences on enrollment over a lengthy period
    - Employs “drivers” for which forecasts are available
- Informed Judgment (e.g., For “special populations”)
  - To account for factors not considered in the statistical model
- Projections considered “Baseline”
  - The best estimate of future enrollment given that the driving factors perform as forecasted
    - Any unusual developments in the internal or external factors could alter future enrollments and invalidate these projections

Identify Model Alternatives "Best Fit" Statistical Analysis

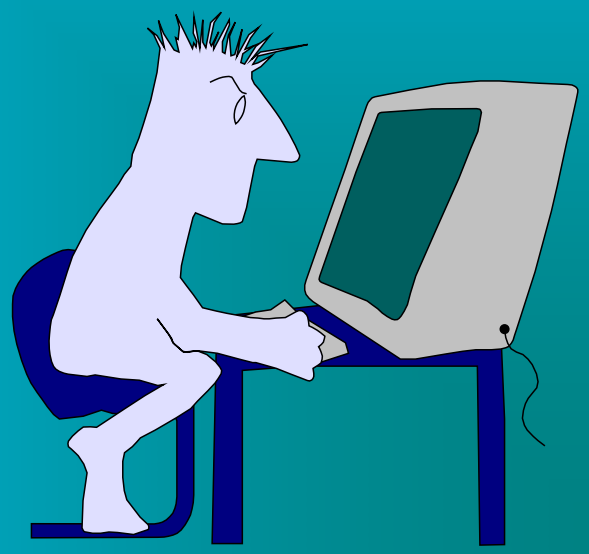
- Techniques
  - Linear regression and statistical curvilinear
- Evaluation of Validity
  - Cause-effect relationships
    - E.g., Tuition ↑, Enrollment ↑ (Let's raise tuition!)
- Turning Points
  - **Objective is to identify upturns and downturns in enrollment**
    - Personal Income never declines, so it cannot predict a drop in enrollment

Enrollment Projections Methodology
Acquire Data (Minimum=10 years of history)

- External (examples)
  - Population -- total and by age (target market age groups)
  - Personal income -- total & per capita (current and real $) & average per job
  - Total employment (or by industry if applicable)
  - Employment-to-population ratio
  - Unemployment rate
  - Competitors' tuition
  - Public high school seniors & graduates
  - Competitors' policies (e.g., enrollment cap implementation or delayed entry)
- Internal (examples)
  - Enrollments by segment
  - Tuition/fees
  - New campus/facilities, etc.
  - Business Practices Change
  - New or discontinued initiatives

Secondary Data Sources

- U.S. Government
  - Census Bureau
    - Decennial census
    - Intercensal estimates & surveys (American Community)
    - Economic Census/County Business Patterns
  - Labor (BLS)
    - Employment & Unemployment
  - Commerce (BEA)
    - Employment & Earnings
  - Education
    - IPEDS
  - Federal Reserve Bank
    - Unemployment rate projections



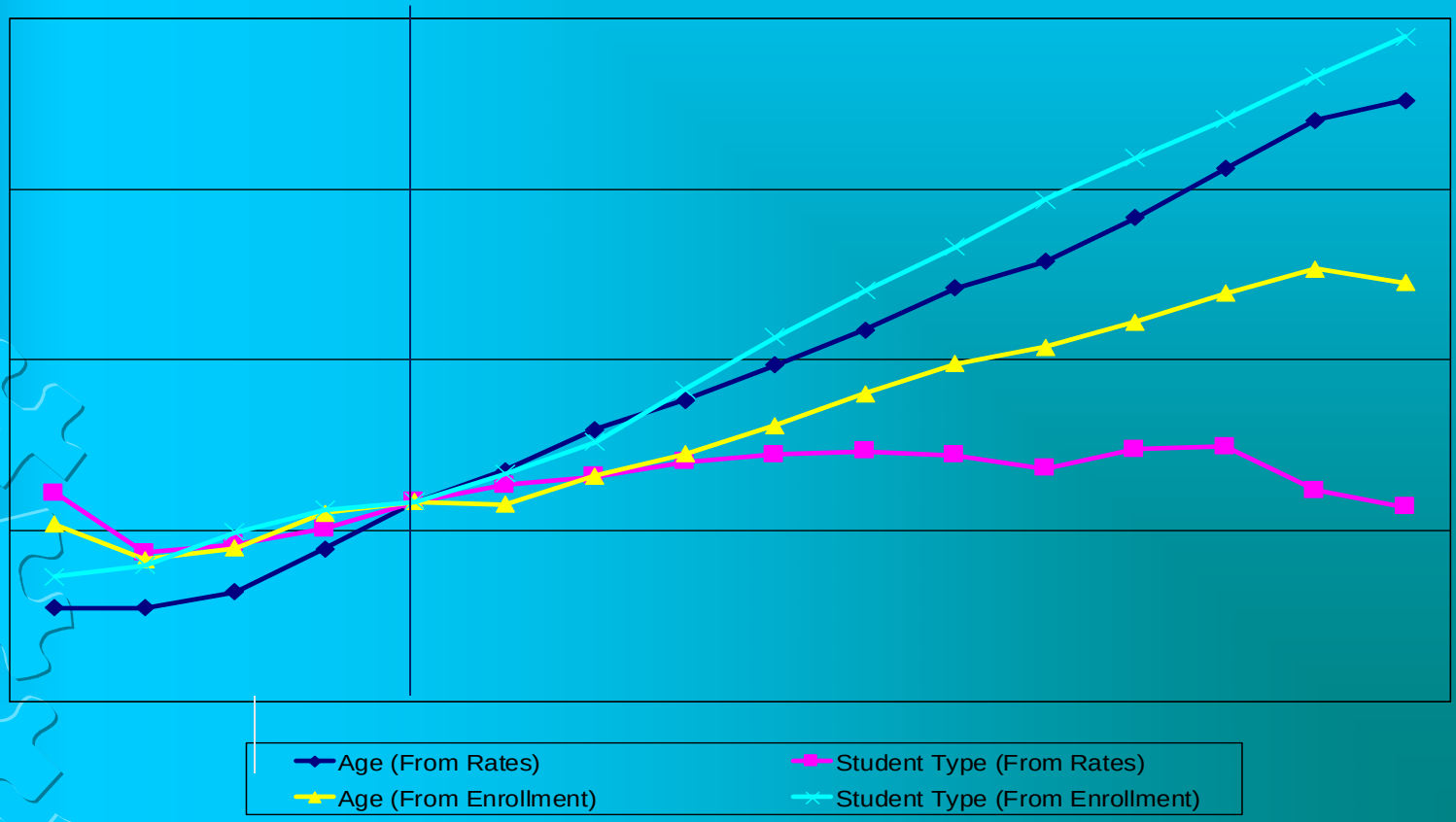
Secondary Data Sources II

- State Government
  - Planning
    - Population, School & Economic Data & Projections
  - Labor
    - Local Area Employment & Unemployment
    - Industry/Occupation Projections
  - Education
    - State Departments Reports

Secondary Data Sources III

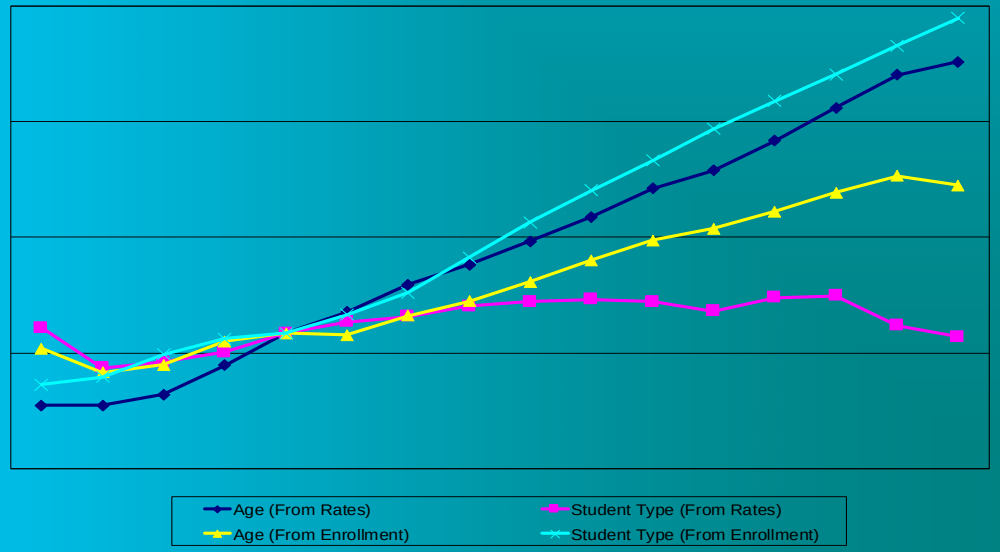
- Private
  - Mortgage Bankers Association
    - Economic Projections
  - Economagic.com
    - “Free” economic time series
      - Federal, state, local
  - Other

Alternative Models
Which predictor(s) yields the most likely projections?

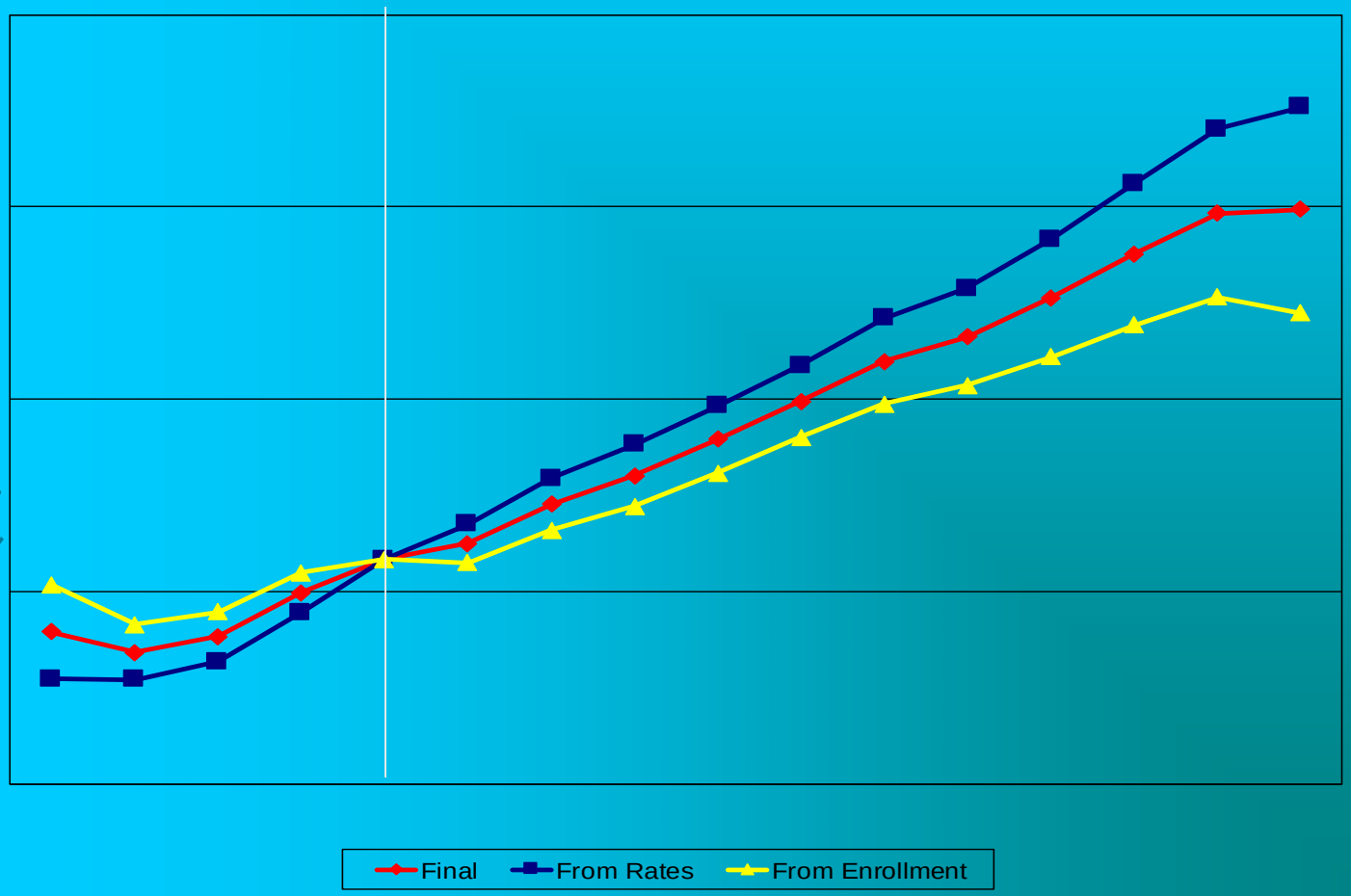


Finalize Model

- Eliminate “Bad-Fit” Models
  - E.g. student type models
    - Most divergent results and least accurate predictions
- Establish Final Model
  - Both age models plausible
    - Limited divergence and accurate predictors of last 5 years
  - Average student age models from enrollment and penetration rates



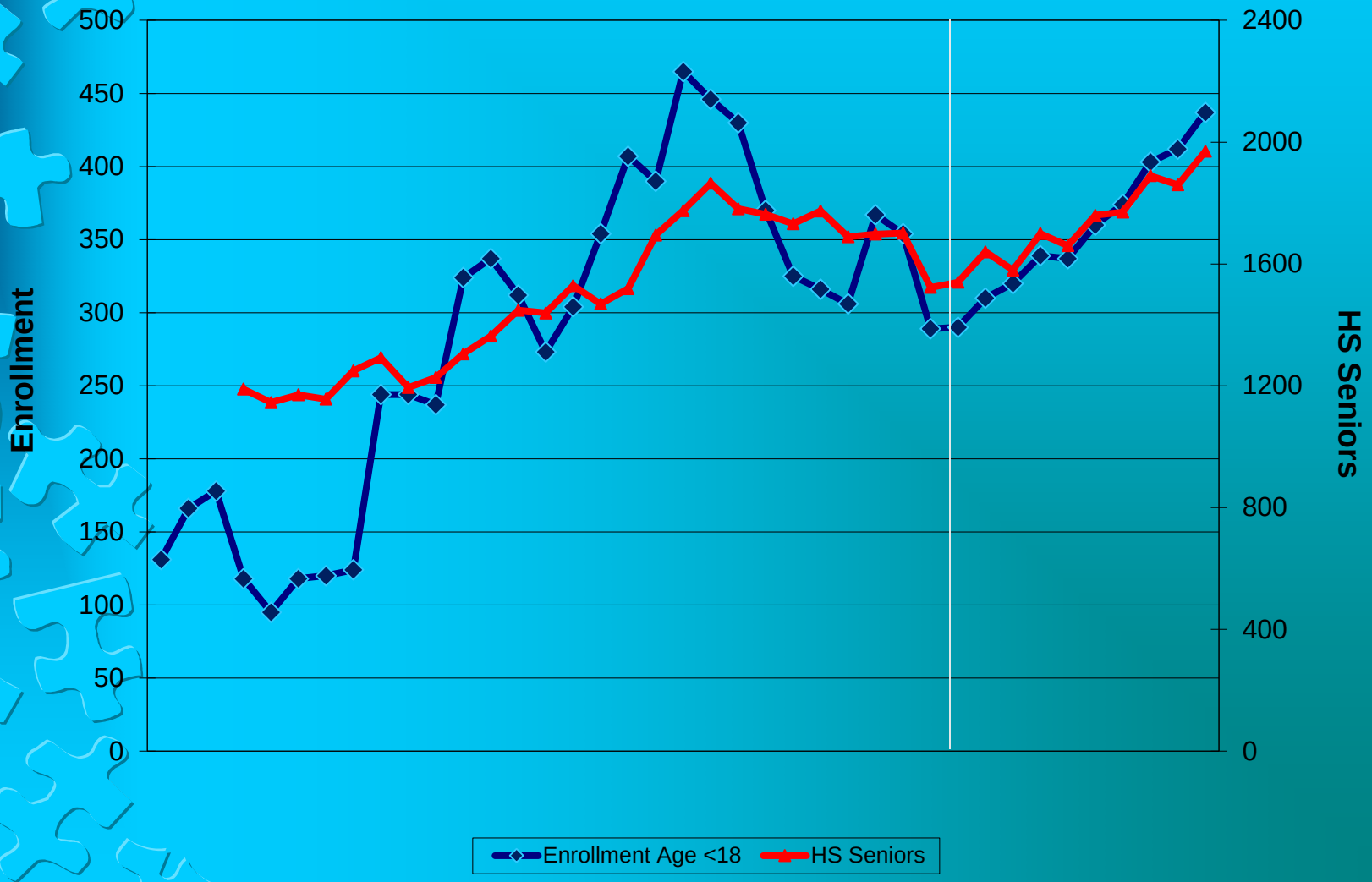
Fall Credit Headcount Projections
Student Age by Penetration Rate/Enrollment



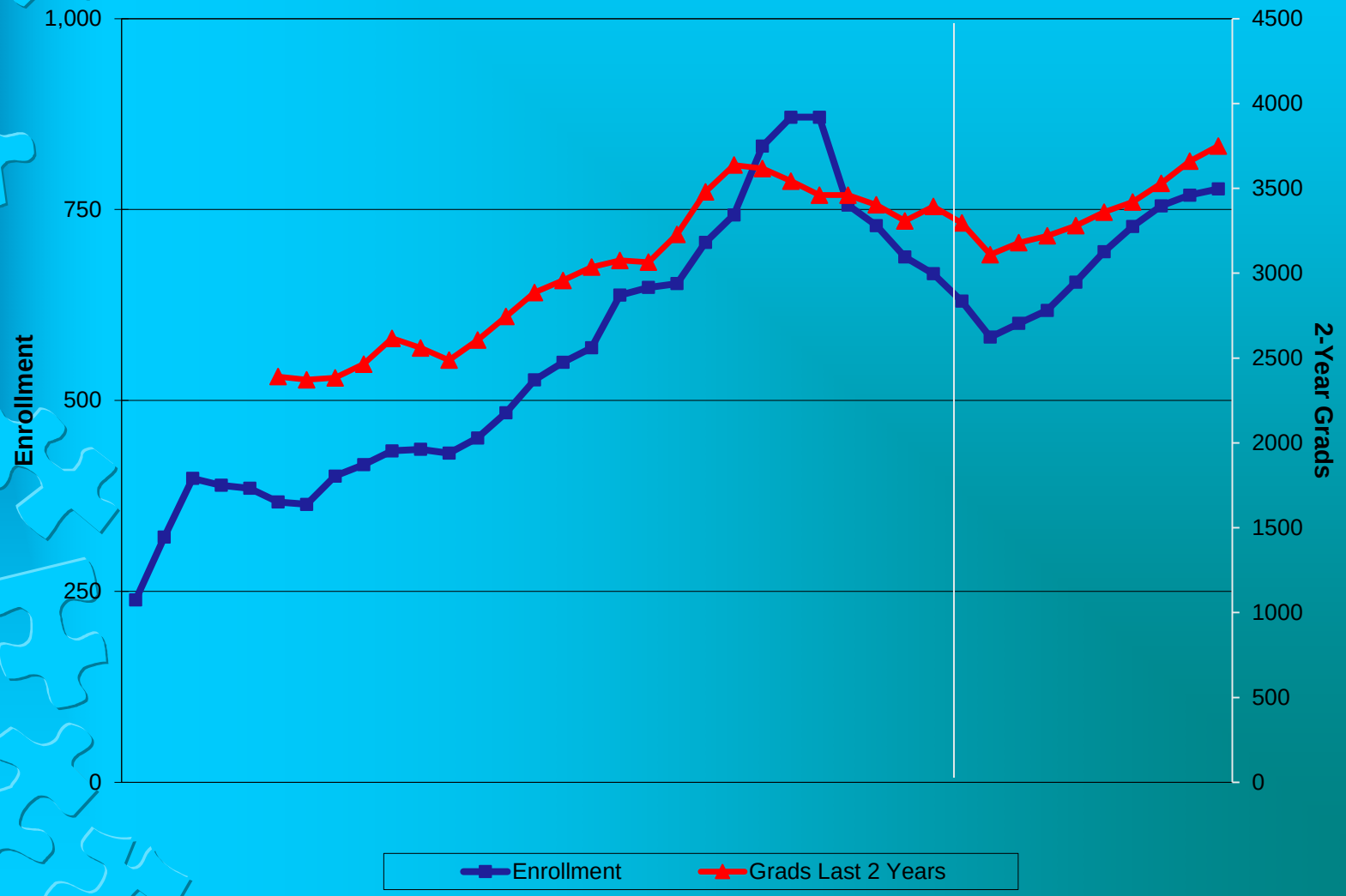
Identify Model Alternatives Technical Methodology

1. ***Project Fall term credit headcount***
2. Project Fall FTEs
3. Project FY Annual FTEs (& Headcount if necessary)
4. Identify Headcount and FTEs from *major* factors not captured in the projection model
5. Revise Headcount and FTE projections

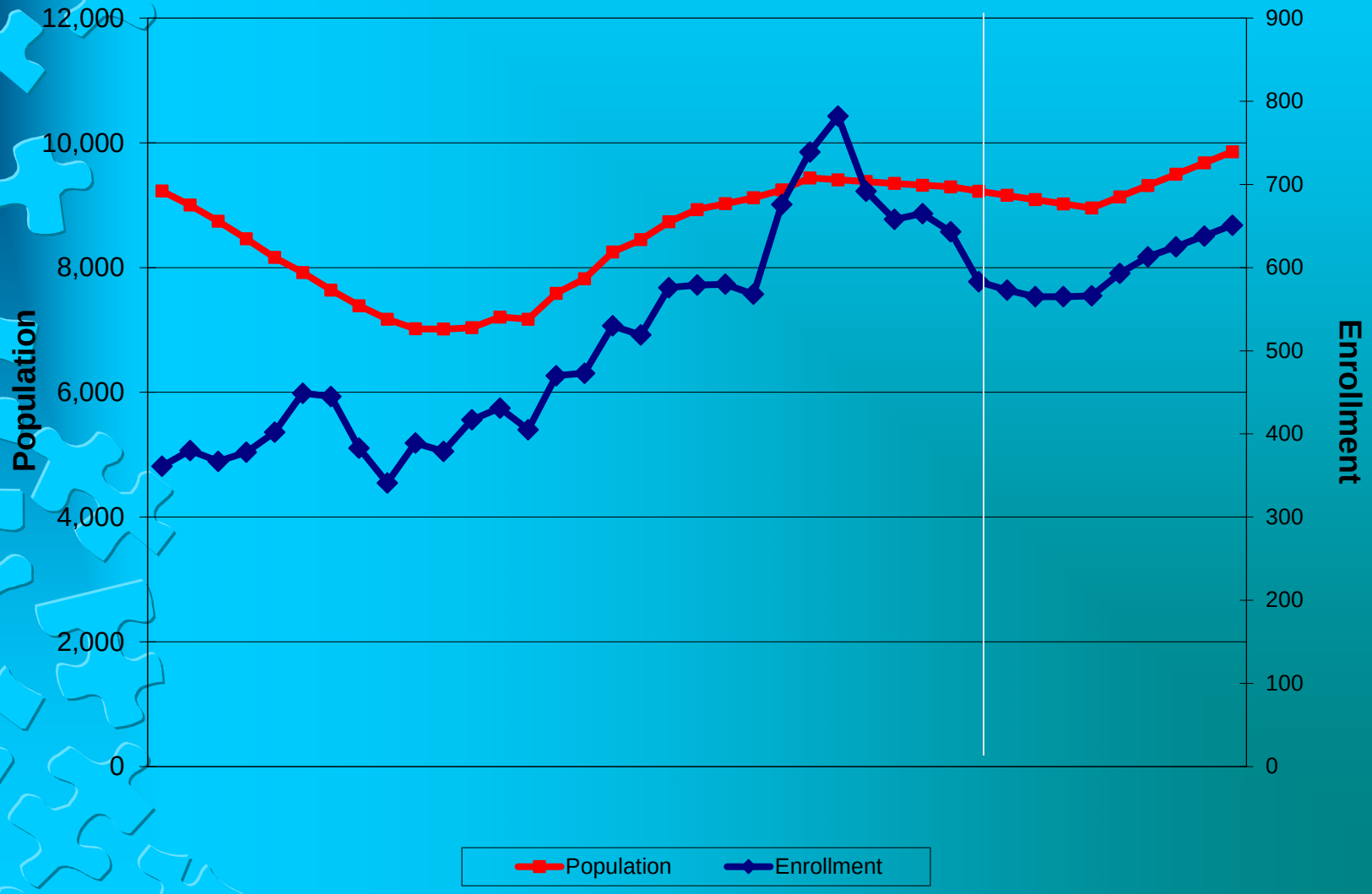
Fall Credit Headcount Projections
Age Under 18



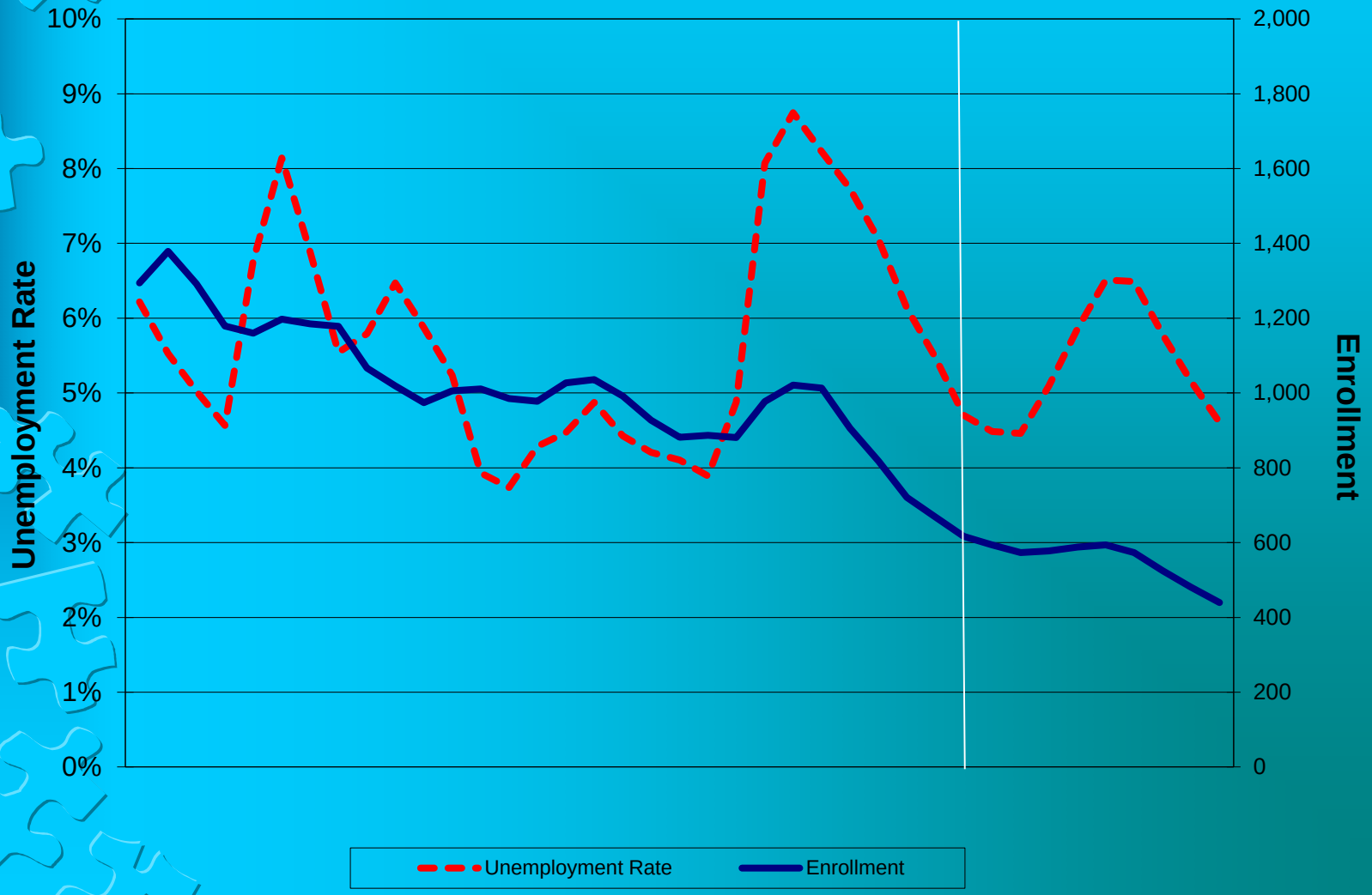
Fall Credit Headcount Projections
Age 18-19



Fall Credit Headcount Projections
Age 20-24



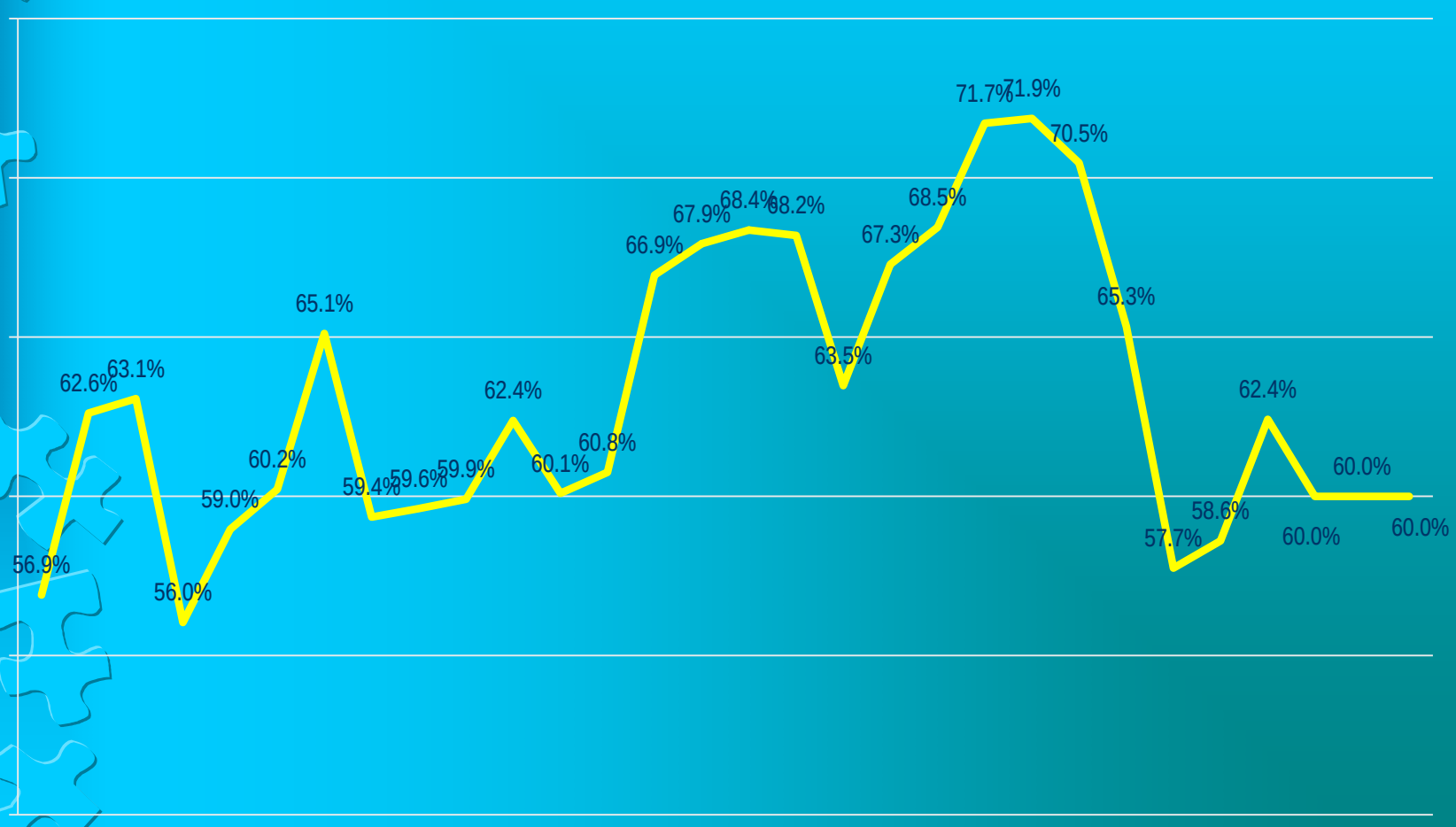
Fall Credit Headcount Projections
Age 25+



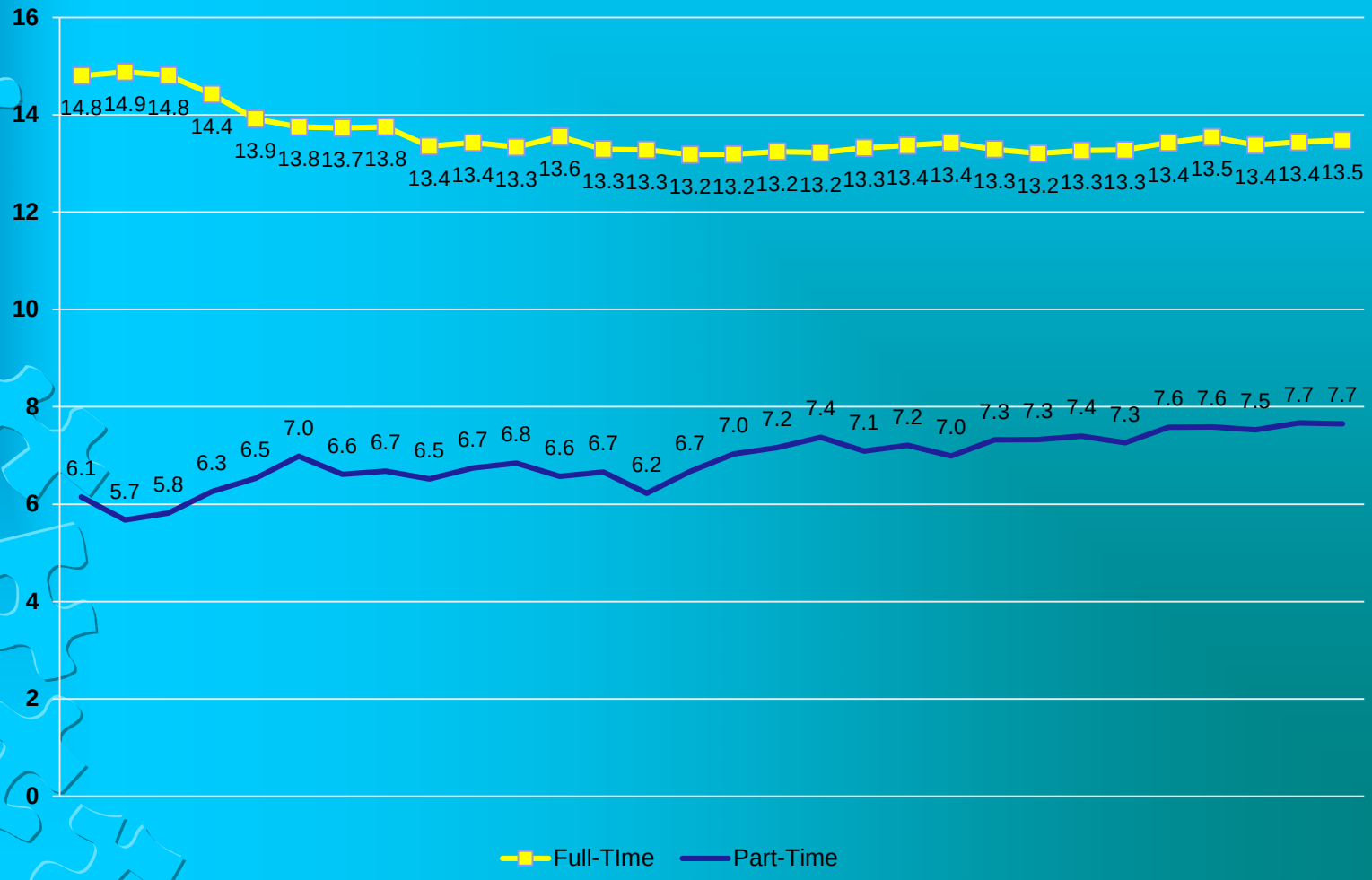
Identify Model Alternatives Technical Methodology

1. Project Fall term credit headcount
2. **Project Fall FTEs**
   - Use Heads % FT/PT & Average Credit Load by Segment
3. Project FY Annual FTEs (& Headcount if necessary)
4. Identify Headcount and FTEs from *major* factors not captured in the projection model
5. Revise Headcount and FTE projections

Enrollment Projections Methodology
Percent Full-Time, Age 18-19



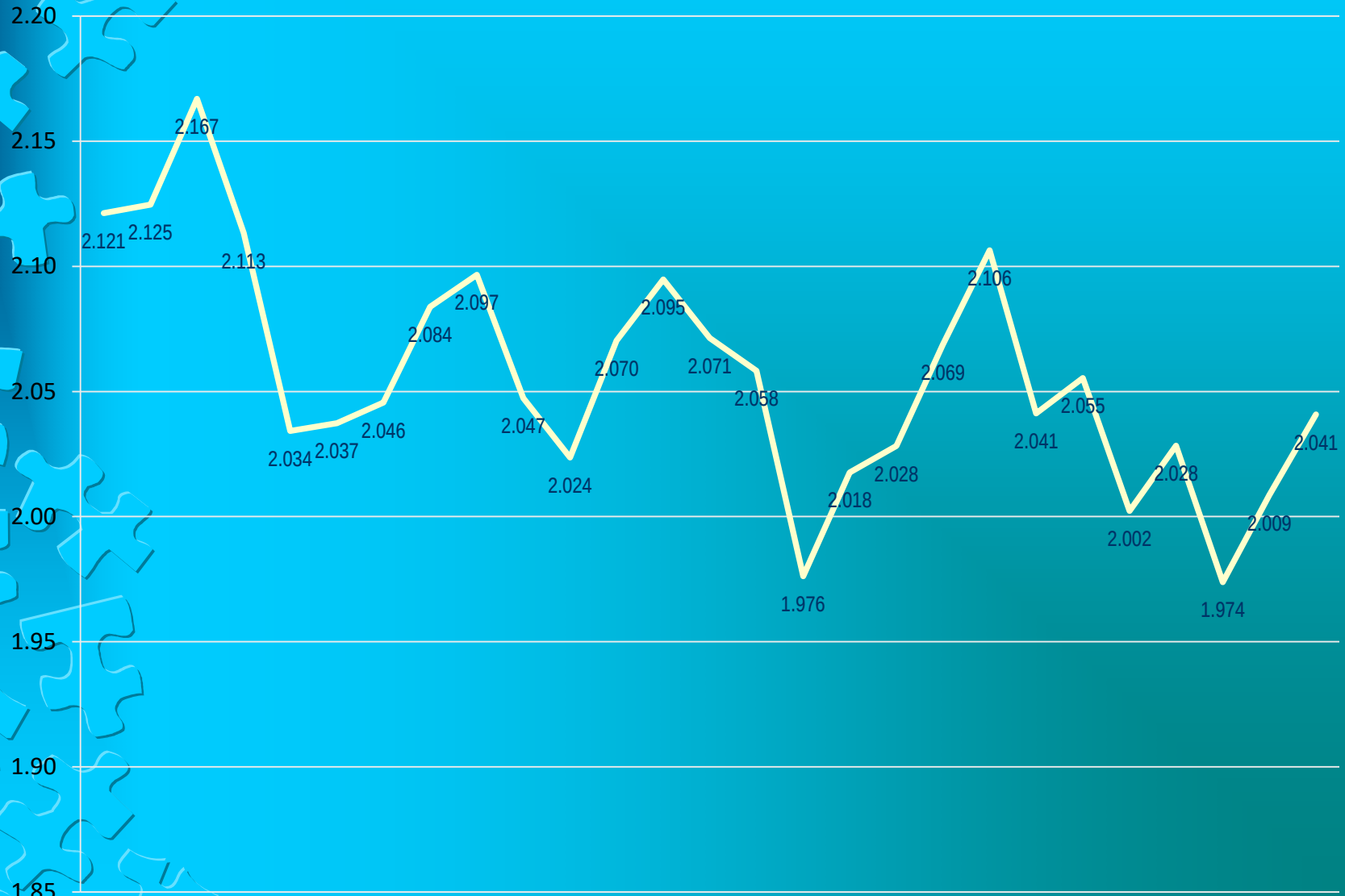
Fall Term
Average Credit Load, Age 18-19



Identify Model Alternatives Technical Methodology

1. Project Fall term credit headcount
2. Project Fall FTEs
3. **Project FY Annual FTEs (& Headcount if necessary)**
   - Use Ratios of Annual to Fall or % Changes Annually vs. Fall
4. Identify Headcount and FTEs from *major* factors not captured in the projection model
   - Facilities
   - New Programs
   - Environment
   - Others
5. Revise Headcount and FTE projections

Enrollment Projections Methodology
Ratio of Fiscal Year to Fall FTES



Enrollment Projections Methodology
FTE Changes, Fall & Fiscal Year

Identify Model Alternatives Technical Methodology

1. Project Fall term credit headcount
2. Project Fall FTEs
3. Project FY Annual FTEs (& Headcount if necessary)
4. **Identify Headcount and FTEs from *major* factors not captured in the projection model**
   - Facilities
   - New Programs
   - Environment
   - Others
5. **Revise Headcount and FTE projections**

Identify Model Alternatives Technical Methodology

- Revise Headcount and FTE projections based upon external adjustments

Projections	Fall Headcount	Annual Headcount	Annual Funded FTEs	Annual Total FTEs
Baseline	14,791	21,553	8,716	8,985
Adjusted		21,852		9,063
Adjustments	Headcount		Total FTEs	
Factor	**+**	**-**	**+**	**-**
Total Adjustments	299	0	78	0
AMIL Buildout	40		14	
E-Army-U	180		18	
Information Systems Security	19		10	
Fire Dept. Certificate	60		36	

Noncredit Enrollment

- Can be projected using similar technique(s) as credit
- Projection series and timing might be different
  - Not fall headcount to fall FTEs to annual FTE
- “Drivers” may be different depending on the nature of noncredit at individual colleges
  - Workforce programs
  - Adult education
  - Avocational courses

Applications for Enrollment Projections

Short-Term Enrollment Projections Applications

- Budgeting
- Course Schedule Planning

Operational Budgeting

Projections

% Annual FTEs by Term	
Summer Session 2 & 3 (Previous calendar year)	**3.09%**
Fall (Previous calendar year)	**47.44%**
Winter (Current calendar year)	**0.84%**
Spring (Current calendar year)	**41.68%**
Summer Session 1 (Current calendar year)	**6.88%**
Credit by Exam	**0.06%**
Credit Total	**100.00%**

Disaggregate headcount and FTEs by term

Disaggregate headcount and FTEs by unique student groups (based upon tuition rates)

Eligible Students		
In-county	H	F
Dual Enrollment	H	F
Out of-County	H	F
Senior Waivers	H	F
Ineligible Students		
Employees/Dependents	H	F
Out of State/Foreign	H	F

To directly project tuition/ fee revenues and, indirectly, expenses

Key Assumptions in Operational Budgeting

- Data Assumptions
  - Same as last Year? 3-year Average? Trend? Other?
    - Distribution of annual FTES by term (%)
    - Relationships between terms (Headcount and FTEs)
    - Distribution of headcount and FTEs across tuition groups
  - Special populations modeled separately
    - E.g., new types (military)

Course Scheduling Planning

- Determine the number of sections required to run and offered by term to meet next year's budgeted FTE goal
  - Using observed historical relationships re:
    - Class Cancellation Rate
    - Average Class Size

Projecting Section Requirements

- Sections Required to Run
  - Calculate by dividing projected total term FTEs by projected average FTEs per section, e.g.

    3,709 Projected FTEs

    ÷ 1.657 Projected FTEs per section ran

    = 2,239 Projected sections required to run

- Sections Required to Offer
  - Calculate by dividing projected required sections to run by projected run rate (100%-cancellation rate), e.g.

    2,239 Projected sections required to run

    ÷ (1-.1669) Projected cancellation rate = 16.69%

    = 2,688 Projected sections required to offer

Longer Term Applications

Course/ Facilities Planning

- Determine courses and space required by type in X years
  - Simple: Use observed historical relationships re:
    - Distribution of courses across disciplines
    - Facilities Utilization rates per FTE
  - Complex: Project factors
    - Headcount/FTE by major
    - Course taking patterns by major
      - Discipline and room type
    - Ratios of space needs per FTE by discipline and by space type (e.g., computer lab vs. auto shop)

Vincent "Vinnie" Maruggi
Director
Institutional Research, Planning, and Effectiveness
Chesapeake College
Wye Mills, MD
410-829-5859
vmaruggi@chesapeake.edu