



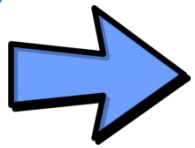
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# FTE Forecasting Principles

**Presented by:**

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Office of Funding and Financial Reporting**

# FTE Forecasting



**Process**



**Models**



**Adjustments**



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# District FTE Forecasting

# Fiscal Consequences of FTE Forecasts

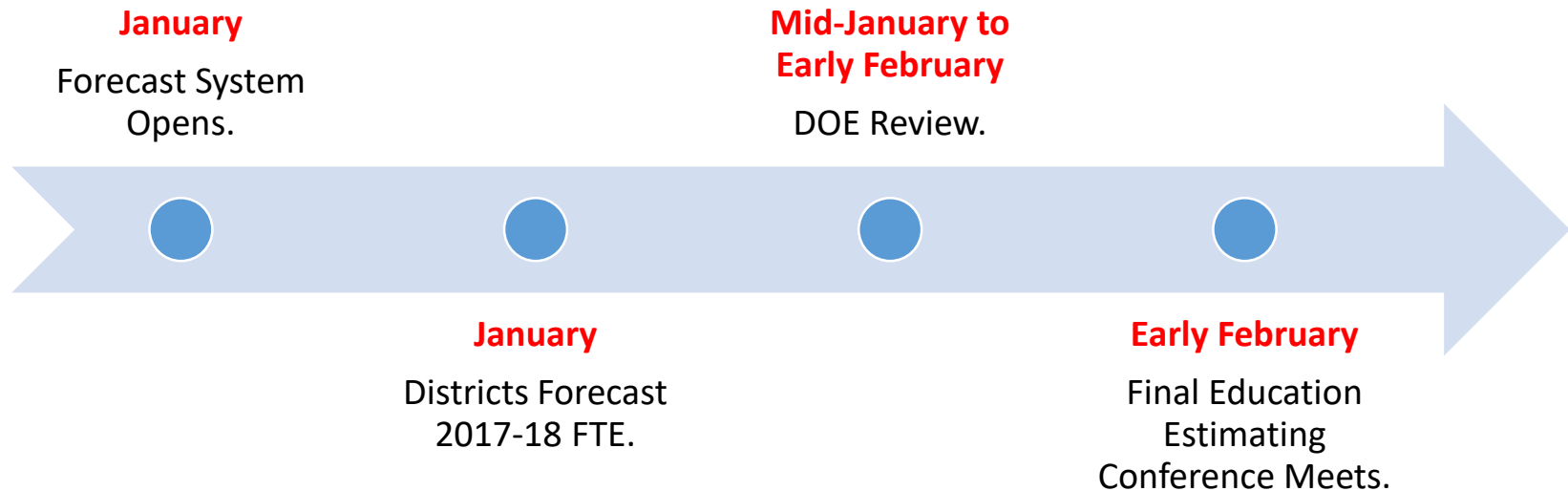
**FEFP funding  
in GAA.**

**Certain  
calculations of  
the FEFP.**

**Cash flow for  
first half of  
fiscal year.**

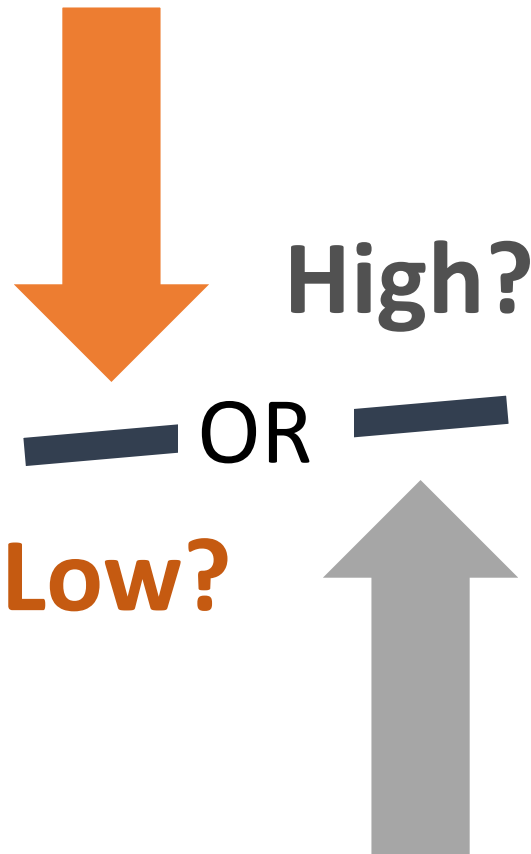
**Group 2 WFTE  
cap.**

# School District Timeline for FTE Forecasting (January Start Date for Legislature)



Note the FTE forecast for the governor's budget is not in the timeline. It is based on an Education Estimating Conference that meets in December. There is no relationship between the forecast done by districts and the forecast used for the governor's budget.

# Strategies



## Direct Effect

Group II Low  
Class Sizes High

## State Level

May cause FEFP  
proration

## Direct Effect

May have  
revenue shortage

## State Level

Unused FEFP  
dollars revert to  
General Revenue

# District Forecast Input Areas

District A	District C	District E	
Finance	Superintendent	Supt.'s Office	Facilities
Vocational	All Assistant Superintendents	School Operations	Curriculum & Inst.
ESE	Finance	Budget Management	Human Resources
ELL	Technology & Information Services	CTE Education	Alternative Ed
Student Assign.	Curriculum Specialists (ELL, CTE, Charter))	Federal and State Compliance	Information Technology Serv.
<b>District B</b>	Planning	Innovation and Accountability	Bilingual Ed & World Lang.
School Operations	ESE	School Choice, Sch. Operations	Charter School Operations
Business Services	Student Services	Assessment , Research, & Data Analysis	Intergovernmental Affairs, Grants Adm. & Community Engagement
Information Services	Human Resources		
Planning	eSchool Principal		
ESE			
Spec. Academic Prog.			
Human Resources			



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# Models

FTE Forecasting uses Cohort Models and Judgment



# What do we mean by “model”?

**We model social phenomena. By “model” we mean a simplified version of reality.**

**“All models are wrong, but some models are useful.” – George E. P. Box.**

**“Wrong” in the sense that it is not a complete representation of reality; and that’s ok.**

## Why is that ok?

**Sometimes too much detail is a bad thing.**

**A map drawn on a one-to-one scale would be perfectly accurate but useless. It must be simplified to contain only enough information to be useful for the designed purpose.**

**(e.g., Road Map, Topographical Map, Weather Map)**

**We never have all relevant information when studying social phenomena.**

**Pretending one has accounted for everything is more dangerous than understanding the strengths and accounting for the weaknesses of a particular model.**

# What does this mean for modeling FTE (i.e., Forecasting)?

**We must decide what is most significant for forecasting FTE.**

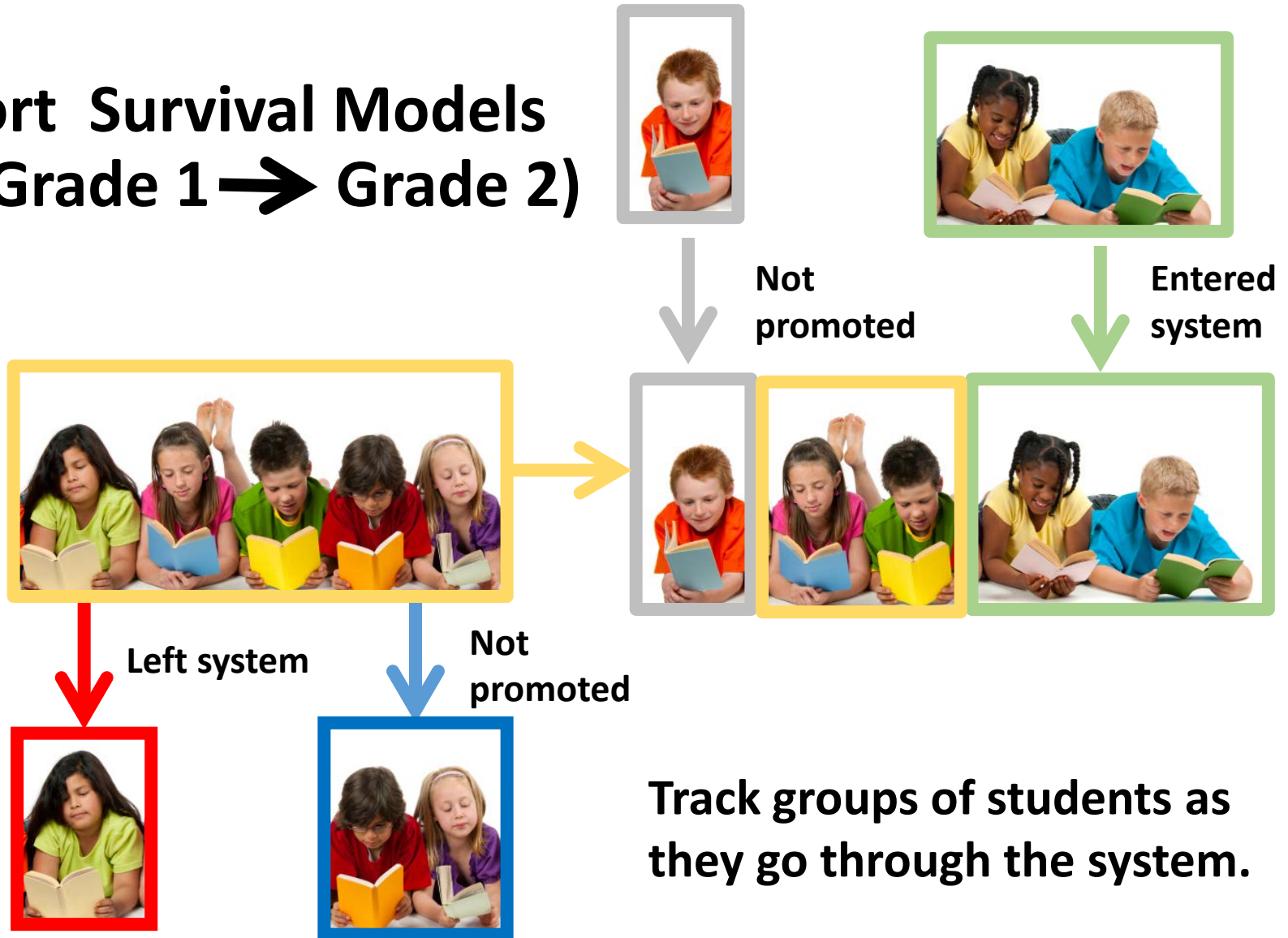
**Avoid introducing extra bias to the model.**

## What is the most significant predictor of FTE?

- 1) **Current FTE – Serves as the jump-off point for forecasts.**
- 2) **Previous Grade Progression Ratios (GPRs) – Models how each grade has progressed in recent history.**

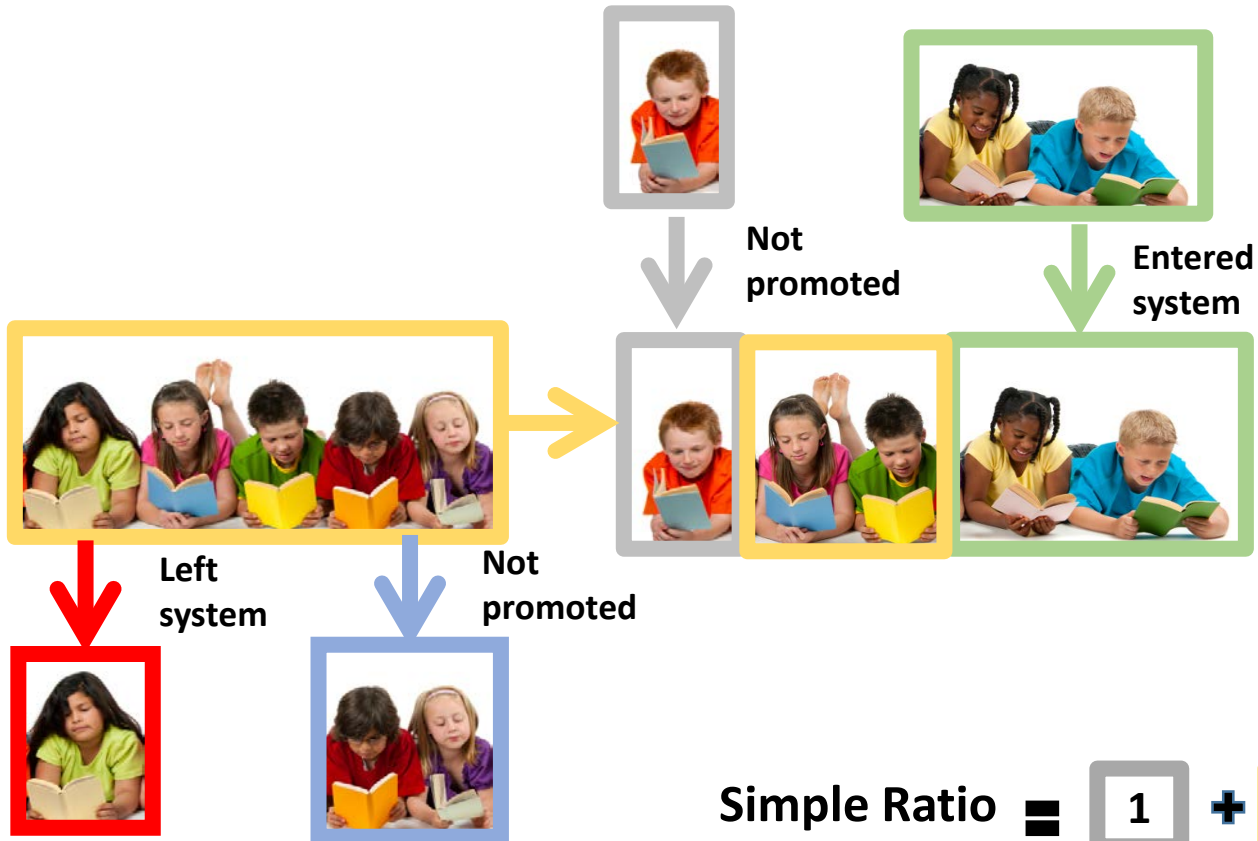
**This describes a grade cohort progression (survival) model.**

# Cohort Survival Models (e.g., Grade 1 → Grade 2)



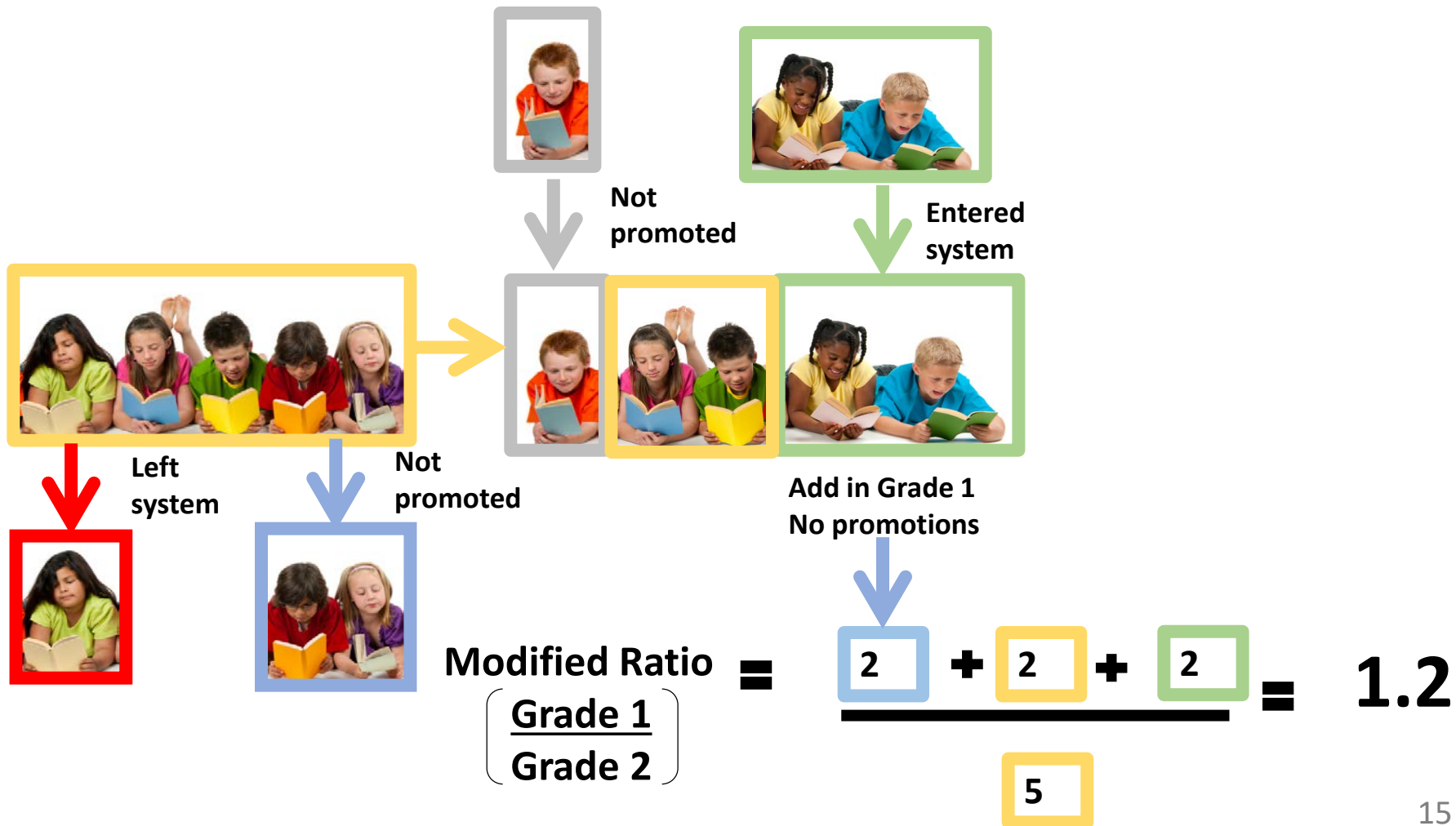
Track groups of students as they go through the system.

# Simple Cohort Survival Ratios (e.g., Grade 1 → Grade 2)



$$\text{Simple Ratio} = \frac{\text{Grade 1}}{\text{Grade 2}} = \frac{1 + 2 + 2}{5} = 1$$

# Modified Cohort Survival Ratios (e.g., Grade 1 → Grade 2)

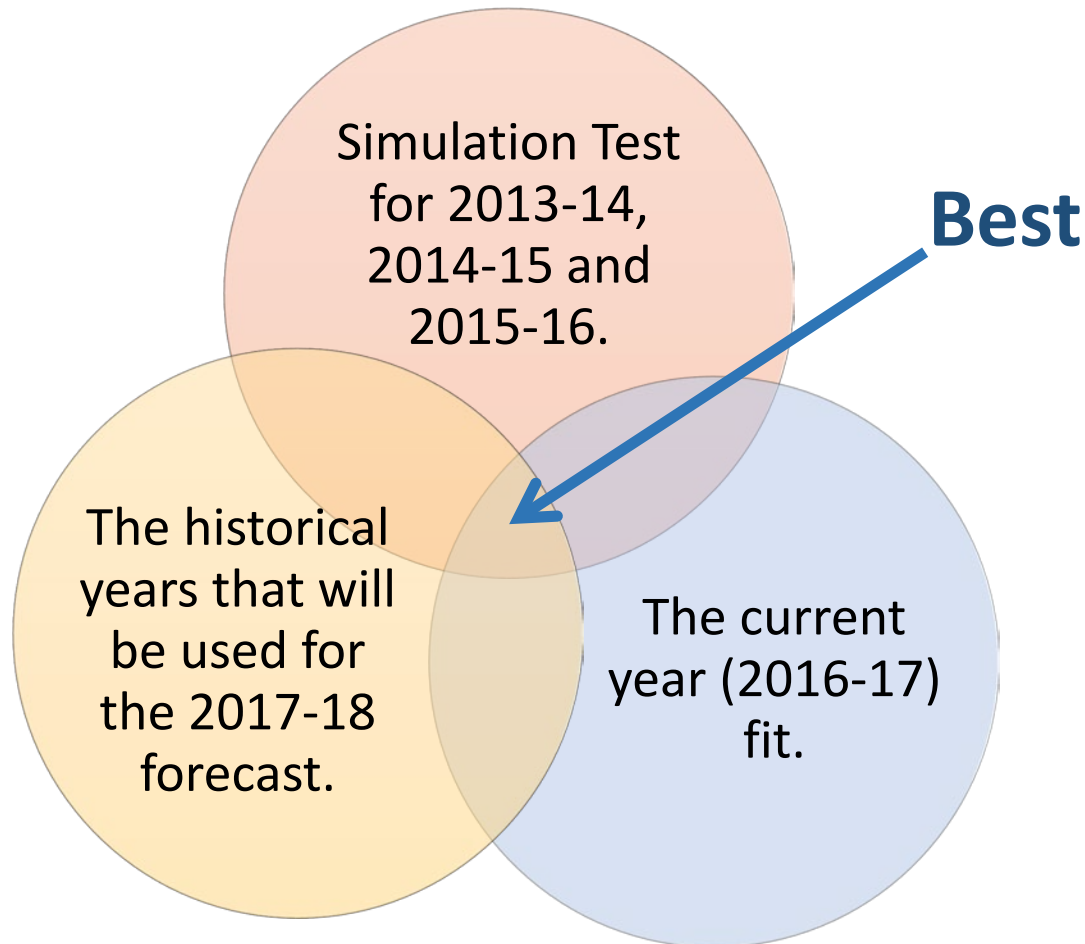


## Cohort Averaging Schemes

Model	Year 5	Year 4	Year 3	Year 2	Year 1 Most Recent Year	Weight of Year 1
1	1	1	1	1	1	0.20
2		1	1	1	1	0.25
3			1	1	1	0.33
4				1	1	0.50
5	1	2	3	4	5	0.33
6		1	2	3	4	0.40
7			1	2	3	0.50
8				1	2	0.67
9					1	1.00



# Selecting the Best Averaging Scheme



## Simulation Test

Each of the three full historical years are simulated

- Model performance is assessed using the absolute value of the forecast minus the actual FTE of the total FTE (absolute deviation)
- Example: forecast = 26,000; actual = 26,500; deviation = -500; absolute deviation = 500

Mean absolute deviation

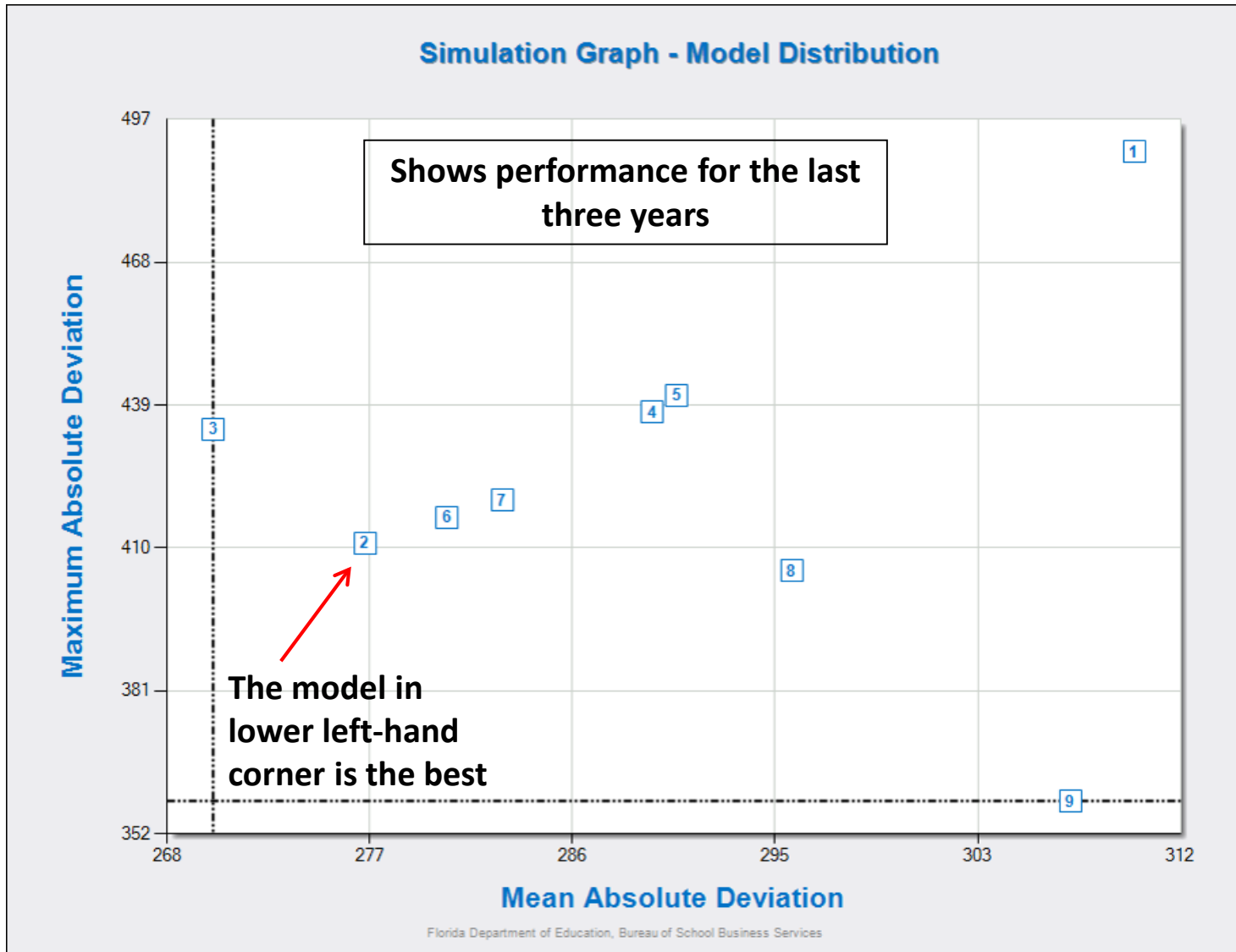
- Simple average of the three absolute deviations

Maximum absolute deviation

- Largest absolute deviation

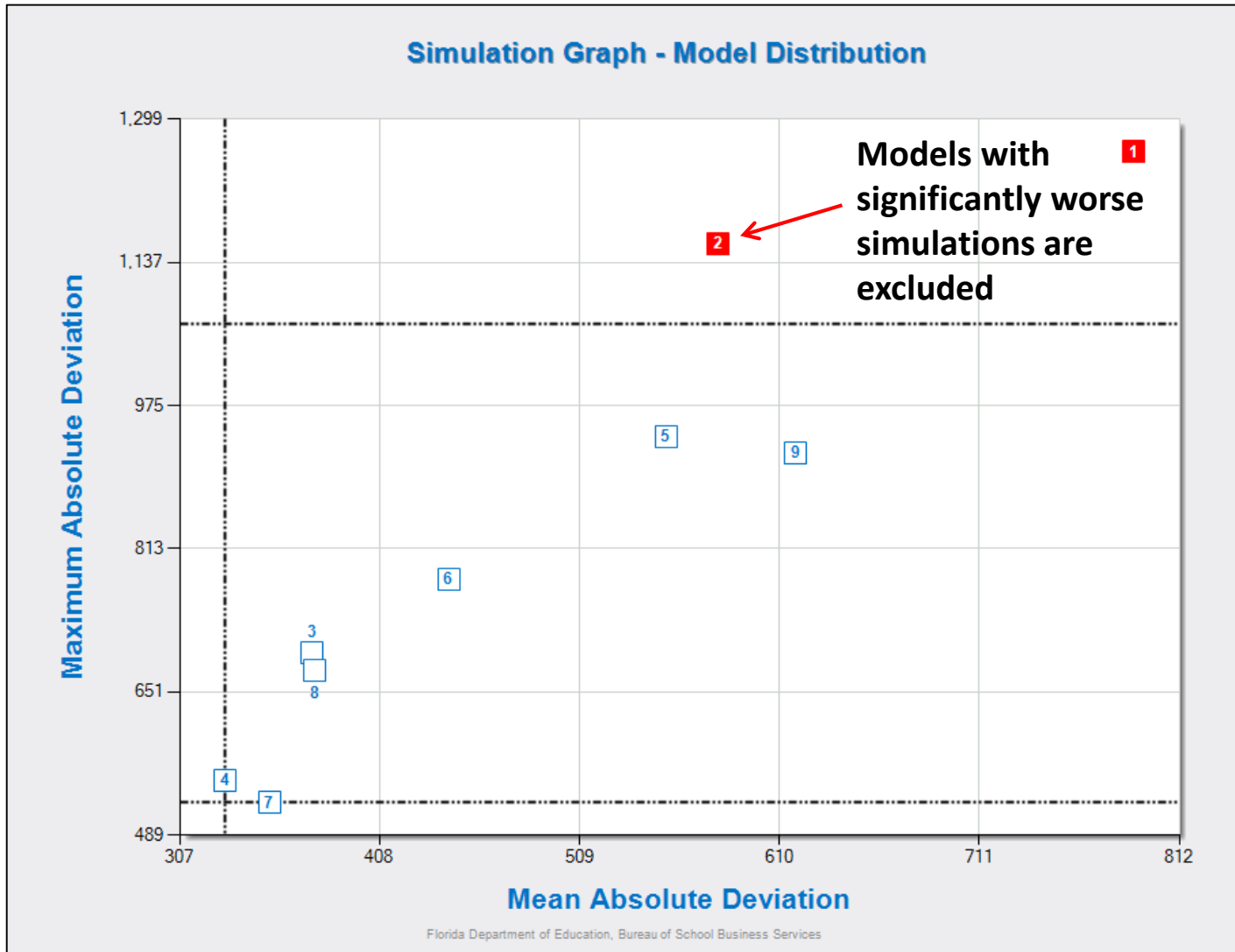
Simulation Graph

- The maximum absolute deviation and the mean absolute deviation are plotted for each model



# Current-Year Fit and Forecast Totals

	Can model be used? ↓	Data plotted for historical years simulation		Current Year Simulation			Forecast ↓	Is the model biased? ↓
	Valid	Max Absolute Deviation	Mean Absolute Deviation	2015 - 2016 Projected	2015 - 2016 Third Calc	Difference	2016 - 2017 Forecasted	Bias Adj
1	OK	490.08	310.31	27,984.85	28,377.55	-392.70	28,766.80	None
2	OK	410.65	276.59	28,054.51	28,377.55	-323.04	28,816.86	None
3	OK	433.81	269.92	28,104.19	28,377.55	-273.36	28,843.58	None
4	OK	437.26	289.17	28,117.12	28,377.55	-260.43	28,963.92	None
5	OK	440.65	290.25	28,065.25	28,377.55	-312.30	28,835.79	None
6	OK	415.94	280.20	28,105.45	28,377.55	-272.10	28,870.33	None
7	OK	419.44	282.59	28,139.40	28,377.55	-238.15	28,905.98	None
8	OK	405.11	295.28	28,174.61	28,377.55	-202.94	28,968.38	None
9	OK	358.29	307.51	28,289.67	28,377.55	-87.88	28,977.35	None



Valid	Max Absolute Deviation	Mean Absolute Deviation	2015 - 2016 Projected	2015 - 2016 Third Calc	Difference	2016 - 2017 Forecasted	Bias Adj
<b>1</b> Not OK	1,262.46	789.30	128,279.94	127,829.46	450.48	128,443.50	None
<b>2</b> Not OK	1,158.63	579.00	128,204.51	127,829.46	375.05	128,383.37	None
<b>3</b> OK	695.07	373.77	128,150.66	127,829.46	321.20	128,528.58	None
<b>4</b> OK	550.79	329.69	128,424.88	127,829.46	595.42	128,187.50	None
<b>5</b> OK	940.19	552.76	128,233.89	127,829.46	404.43	128,381.29	None
<b>6</b> OK	779.05	442.92	128,210.87	127,829.46	381.41	128,350.20	None
<b>7</b> OK	526.00	352.18	128,215.17	127,829.46	385.71	128,328.06	None
<b>8</b> OK	674.53	374.97	128,279.73	127,829.46	450.27	128,127.52	None
<b>9</b> OK	921.99	618.14	127,989.44	127,829.46	159.98	128,007.54	None

# Historical Years That will be Used in the Forecast

Are the years used by the models representative of the forecast year?

Model	2012-13	2013-14	2014-15	2015-16	2016-17
1	X	X	X	X	X
2		X	X	X	X
3			X	X	X
4				X	X
5	X	X	X	X	X
6		X	X	X	X
7			X	X	X
8				X	X
9					X



# Adjustment

This is where you add judgment for trends not captured in the model.



## Judgment Added By Districts

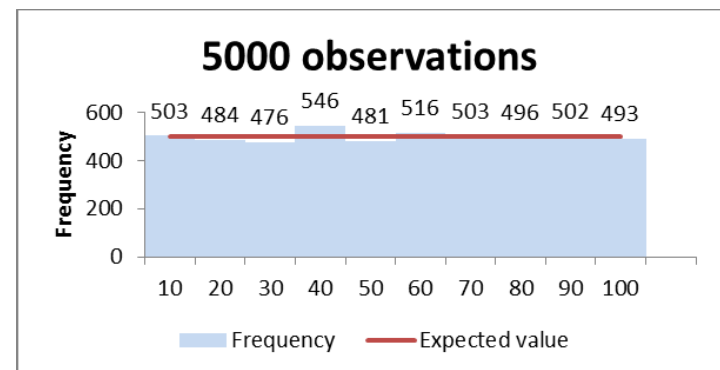
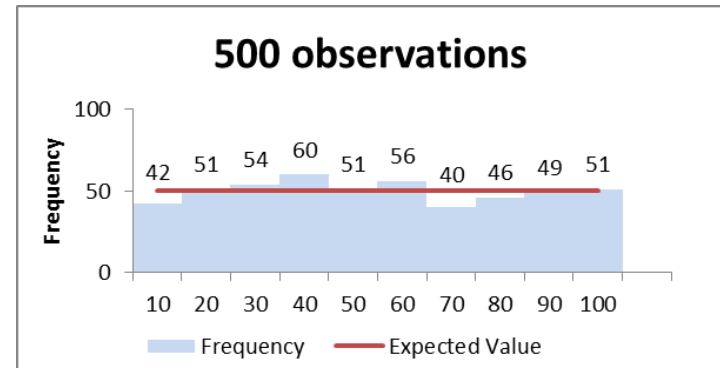
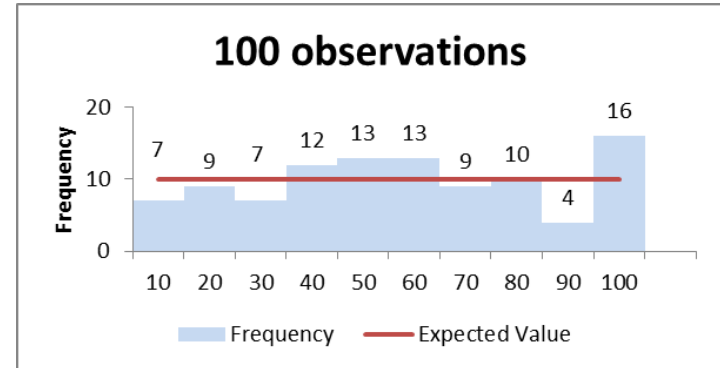
**Choosing the Best  
Cohort Model**

**Adjusting the Best  
Cohort Model**

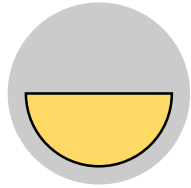
- District Policy
- Change in External Variables

## Randomness Does Not Look Random in the Short Run

- Random numbers (RNs) are expected to fall uniformly within a range.
- Using the random number generator in EXCEL , 100 RNs, then 500 RNs, and finally 5000 RNs, between 1 and 100 inclusive, were generated.
- The results show that randomness looks random only in the long term.

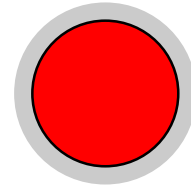


# Adjustments



## Maybe

Charter schools.  
County net migration.  
Controlled open enrollment.  
DJJ students (typically on the decline).  
Tax-credit scholarships.  
District virtual and FLVS.  
Public/private education share.



## No

Randomness.  
Trends forecasted correctly by models.  
Trends without consideration of the cohort structure.

# Bad Example

## FTE Type

- **Charter**

## Cause for Adjustment

- **Two charter schools are opening next year.**

## Narrative Justification

- **Typical charter school draws 10 new FTE to the district.**
- **Two new charter schools x 10 new FTE = +20 adjustment.**

# Corrected Example

## FTE Type

- **Charter**

## Cause for Adjustment

- **Two charter schools are opening next year, attracting students from private education.**

## Narrative Justification

- **After review of charter FTE growth built into our chosen model, we determined that an adjustment was needed.**
- **Historically, four charter schools per year opened, there is a growth of 40 charter FTE in the model.**
- **20 forecasted FTE minus 40 FTE built into the model = -20 FTE adjustment.**

## Now You Are Ready to Enter Adjustments

**For each  
adjustment,  
decide:**

The specific reason for adjustment.

Shift students among programs or  
change the total number of  
students.

FTE Type that will be affected.

Program(s) and grade(s) that will be  
affected.

## When Will DOE Forecasting Staff Call?

**Incomplete  
Narrative  
Justifications**

**Missing  
Offset**

# Example of a District Process

## Pre-Committee

- Run several approved models.
- Compare each run with comparisons (actual and projections).



## Committee Work

- Choose the best model.
- Determine adjustments.



## Post-Committee

- Contact DOE for review.
- Finalize and send forecast.





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