

Using Student Classification Specific Applications and Admissions Data to Forecast Enrollment

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Our Purposes/Objectives

- 1. Discuss the assumptions and procedures to forecast enrollment.**
- 2. Discuss some of the technical and contextual issues involved.**
- 3. Discuss the use of the forecasts to establish applications and admissions targets that will keep student characteristics aligned with the strategic intentions of the university.**
- 4. Discuss the use of forecasting as a targeting and policy tool for social action and for organizing the work of the university.**

“Predictions are best made in a stable system where trends are well established and rates of change for all variables are known. It is even better if that stable system is nested in a stable environment.”

FAT CHANCE

“The farther away the projected time is from the present the more likely the projection will err by some degree. This is especially so when the environment is turbulent, the prediction involves many variables, and/or the system is undergoing continuous change.”

FAT CHANCE

FAT CHANCE'S DIMENSIONS OF CHANGE

The Sources of Change: “Internal” – “External”

The Duration of Change : Short to Long

Magnitude of Change : Small to Large

Frequency of Change : Single or Multiple

The Intensity of Change

The degree of Connectivity of Changes

The Threshold Where the Change makes a difference

Impact of Change (e.g., immediate or delayed)

And of course the

System's Response to Change

$$\mathbf{E} = \mathbf{I} + (\mathbf{C} - \mathbf{O})$$

Where I = INPUT STREAMS

(First Time In College, Transfers, Non-degree Seeking Graduate Students, Masters Students and Doctoral Students)

Where C = Continuing Students

Where O = OUTPUT STREAMS

(Graduates, Drop-outs, Stop-outs, Transfers)

Three “Simple” Steps

1. Accurately estimate the Number of Continuing Students (C)
2. Estimate “Output and Loss” (O)
3. Accurately estimate the Number of New Students (I)

With enough lead time to allow organizational adaptations should they be needed.

FOCUS: CONTINUING STUDENTS

1. Establish if persistence is a stable element or if there have been changes in persistence. In the illustration below, fall-to-fall and spring –to-fall persistence have been steadily climbing. Note also that the 7 Year Average difference between Fall-to-Fall and Spring-to-Fall is 4.37 percent. For the last three time periods, the difference is 4.5 percent.
2. Establish the appropriate data unit(s). For some institutions, that have active spring new enrollments and or staggered degree programs, spring-to-fall may provide a better measure of persistence.

Fall-to-Fall	1997-1998	1998-1999	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004*
Academic Persistence	53.4%	55.3%	55.1%	56.4%	58.9%	59.8%	60.8%
Spring-to-Fall	1998	1999	2000	2001	2002	2003	2004*
Academic Persistence	59.7%	60.4%	59.2%	58.0%	63.3%	64.6%	65.1%

FOCUS: NEW STUDENTS

1. Establish Trends and/or Changes in Matriculation Rates (Admitted to Enrolled) for entering students by classification. Note that for some university's the only meaningful classifications are freshmen and graduate students.
2. The illustration below provides 6 years of data on the percent of admitted students by classification that actually enrolled. E.g., 49% of the admitted freshmen in fall 2003, actually enrolled.

Fall Semester	1998	1999	2000	2001	2002	2003
Freshman	0.5	0.5	0.53	0.55	0.45	0.49
Sophomore	0.65	0.62	0.66	0.66	0.60	0.57
Junior	0.66	0.65	0.66	0.66	0.62	0.84
Senior	0.67	0.66	0.67	0.67	0.59	0.72
Post-Bac. Non	0.68	0.66	0.65	0.68	0.65	0.81
Masters	0.52	0.54	0.52	0.52	0.50	0.55
Ph.D.	0.42	0.43	0.42	0.42	0.42	0.45

The next slide shows the input streams for fall 2003

Focus on New Students: Establish Input Streams

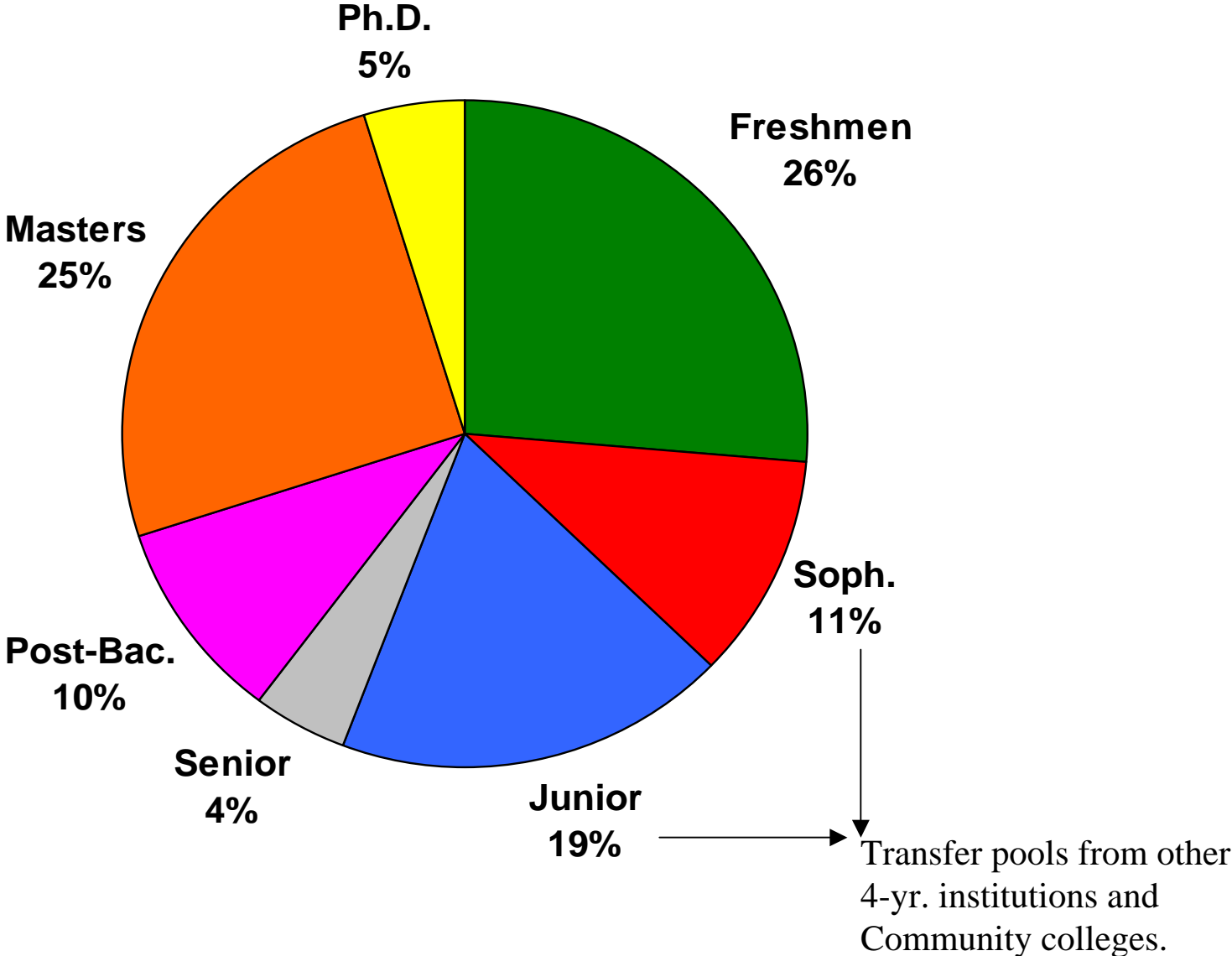
Fall 2003 Streams

Fall 2003	New Applications	Admitted	Number Applied who Enrolled	Percent Applied	Percent of Applied who were Admitted	Percent of Admitted Who Enrolled
Freshmen	5,402	2,348	1,151	100%	43%	49%
Sophomore	1,293	835	472	100%	65%	57%
Junior	1,368	970	819	100%	71%	84%
Senior	456	267	192	100%	59%	72%

Fall 2003	New Applications	Admitted	Number Applied who Enrolled	Percent Applied	Percent of Applied who were Admitted	Percent of Admitted Who Enrolled
Grad. Non-Degree Seeking	678	532	430	100%	78%	81%
Terminal Masters (e.g., MBA)	2,884	1,810	1,033	100%	63%	57%
Masters	224	122	63	100%	54%	52%
Ph.D.	957	466	209	100%	49%	45%

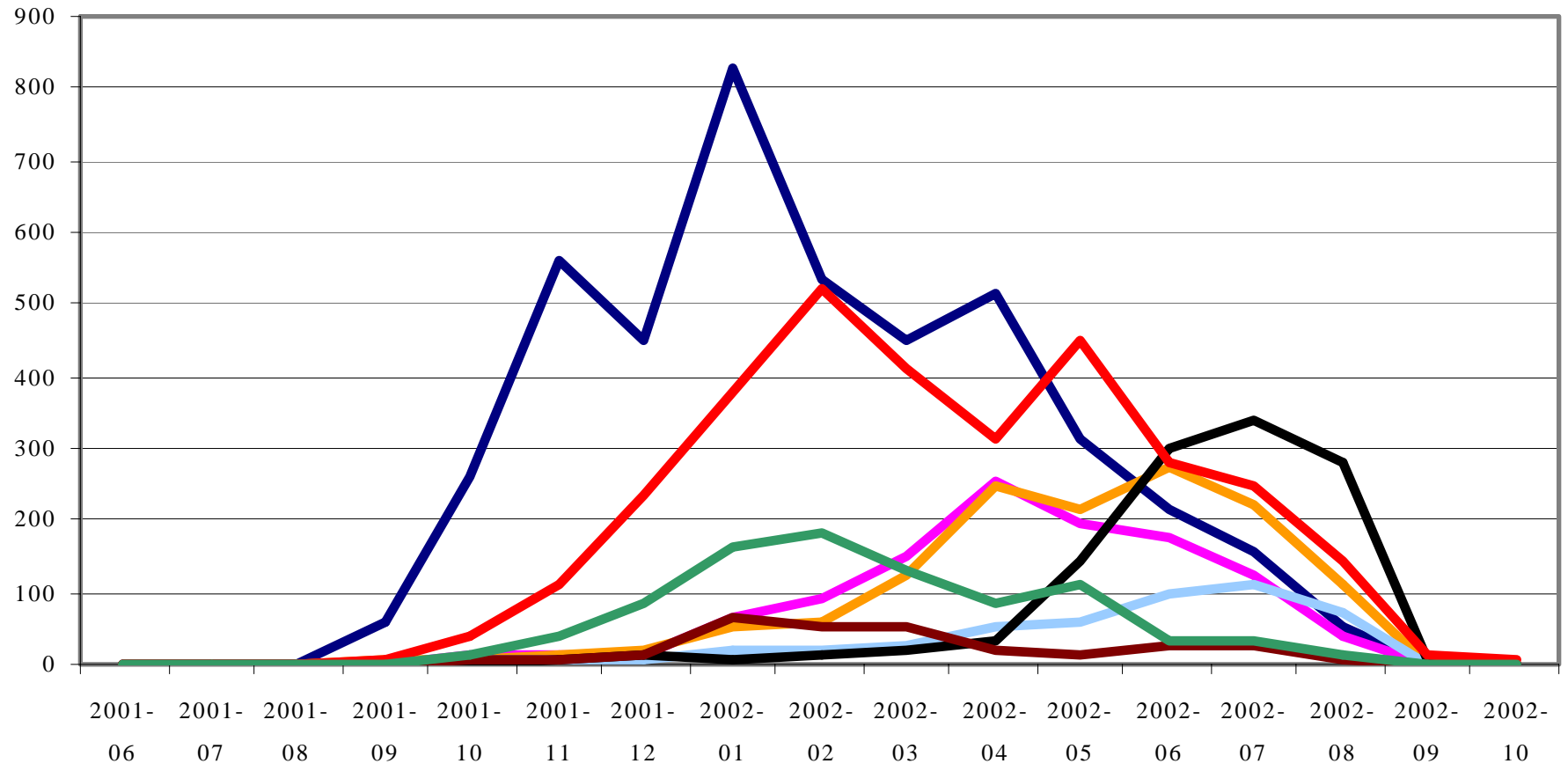
Percent of Total New Student Applications of who enrolled Fall 2003 by Classification.

N= 4,369 new student enrollees



ESTABLISH THE PERIODICITY OF APPLICATIONS (as a means to staff and regulate work flow)

Applications by Student Classification for Fall 2002

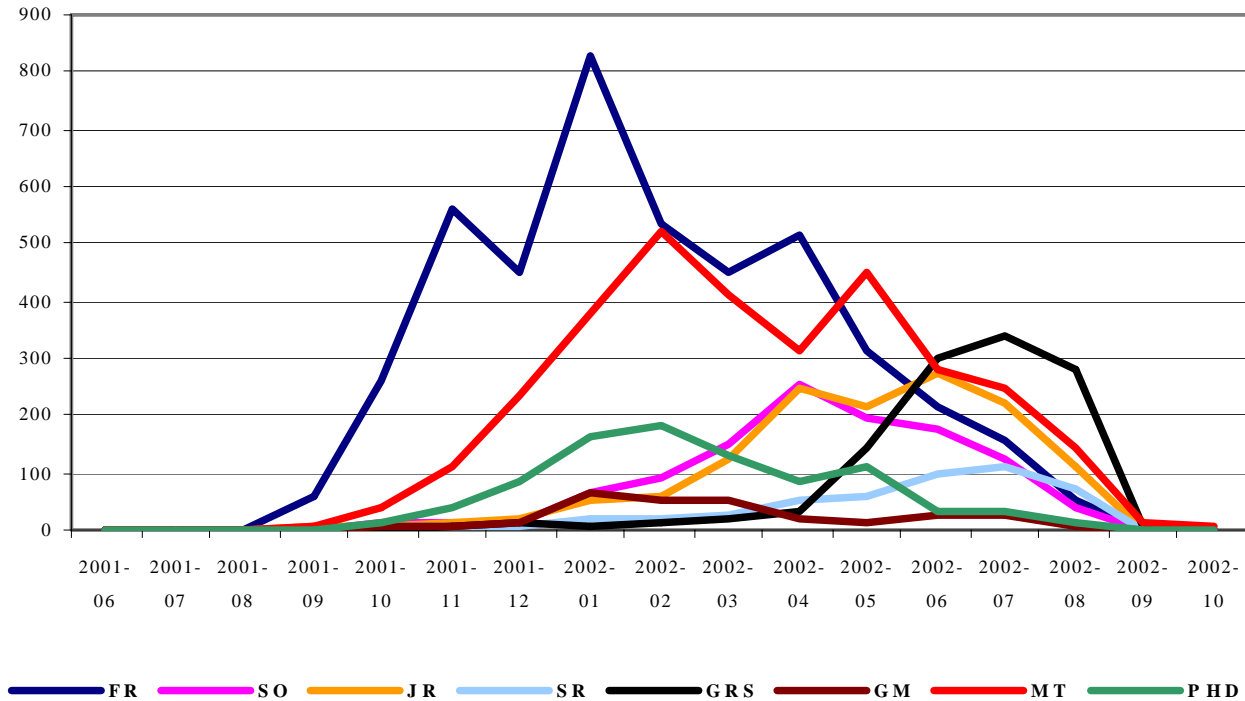


FR SO JR SR GRS GM MT PHD

Continue to new slide →

THE PERIODICITY OF APPLICATIONS (as a means to staff and regulate work flow)

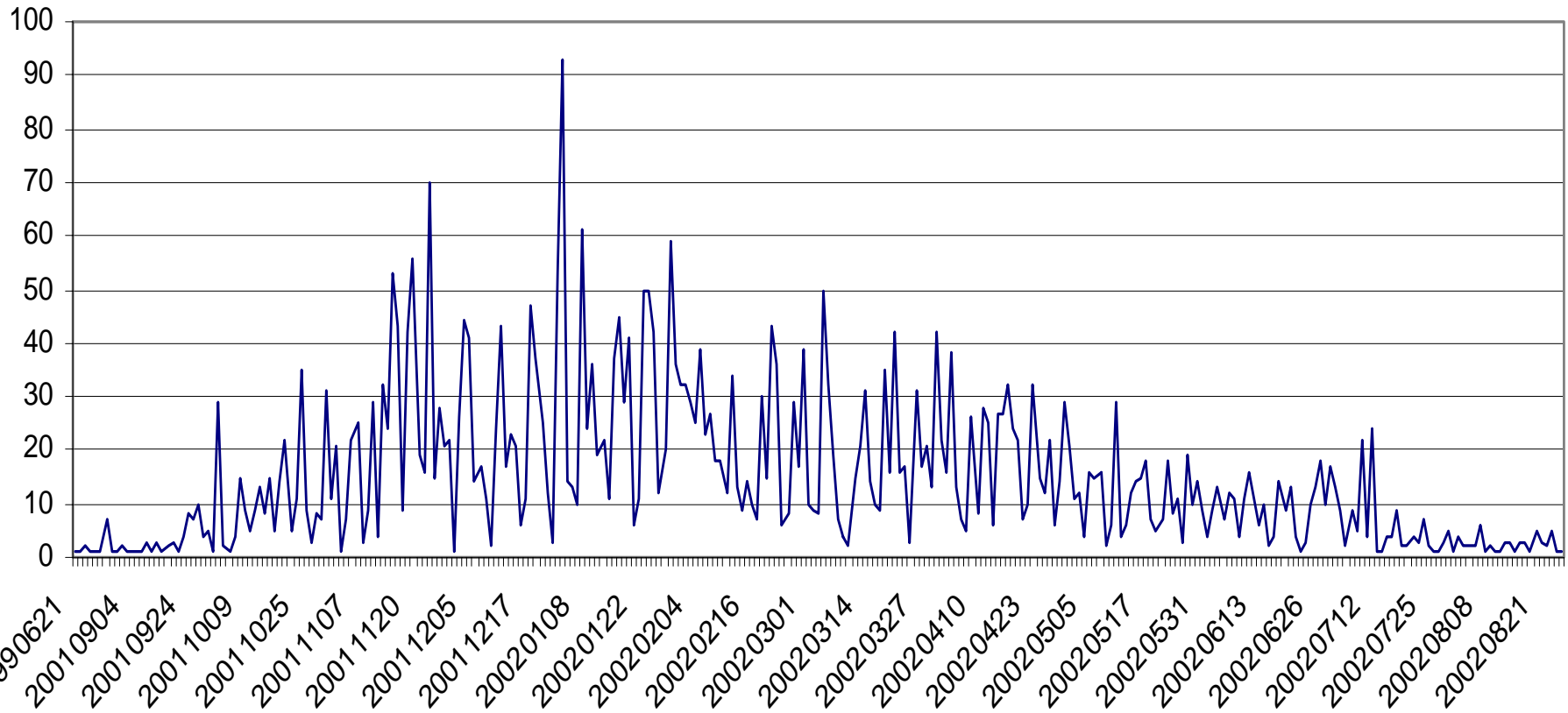
Applications by Student Classification for Fall 2002



Note that applications-by-date for each student classification has its own pattern. These patterns are quite consistent over time. For example, Junior transfers peak in two areas—after the fall semester ends and near the end of the spring semester. These patterns can be anticipated to manage office workflow, and processing.

NOISY DATA: Day-to-Day and Week-to-Week Activity Flows

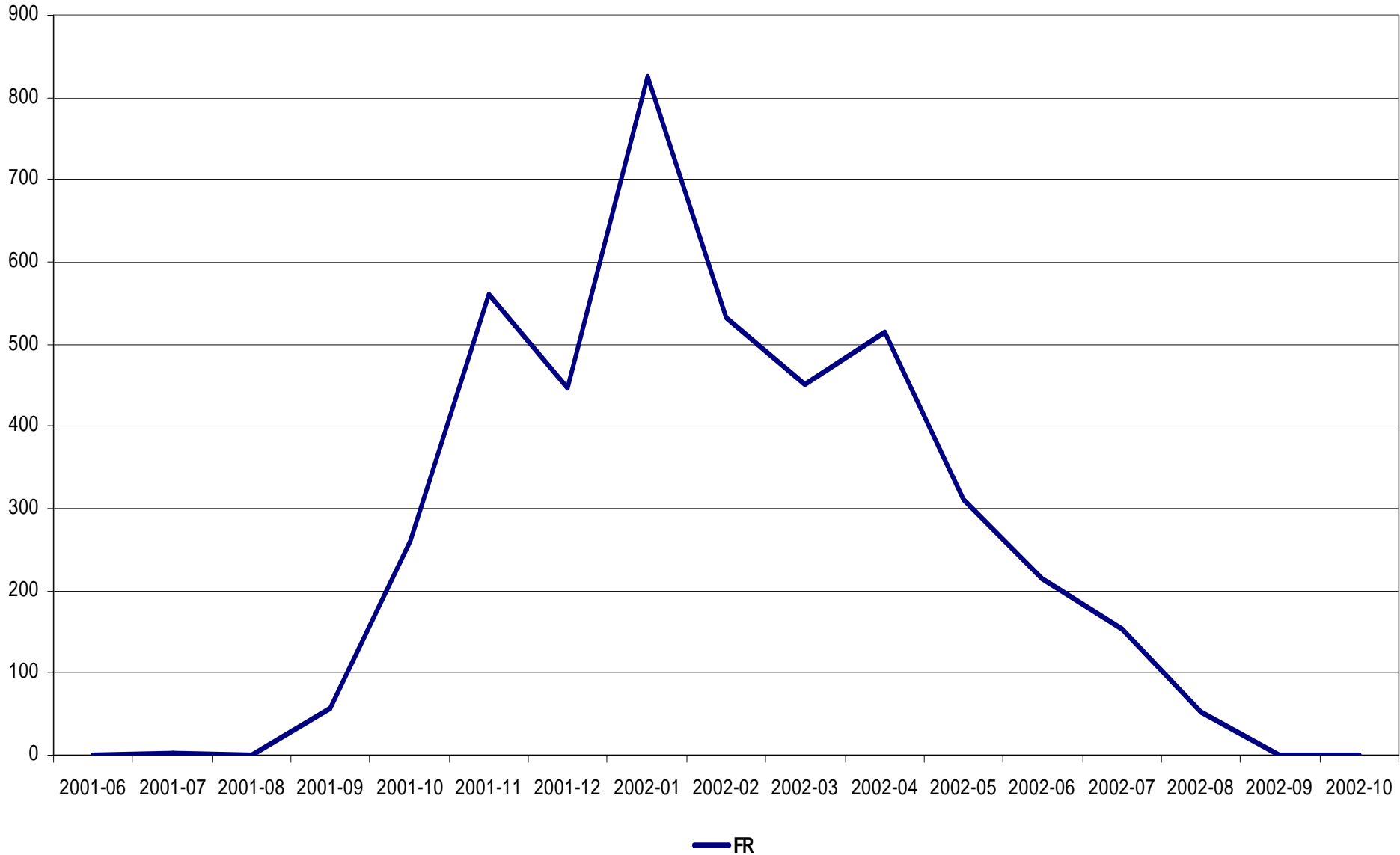
Count of Freshman Applications Fall 2002



Before smoothing, the daily data appears quite noisy. The next slide shows this data smoothed by month.

SMOOTHING BY USING MONTH

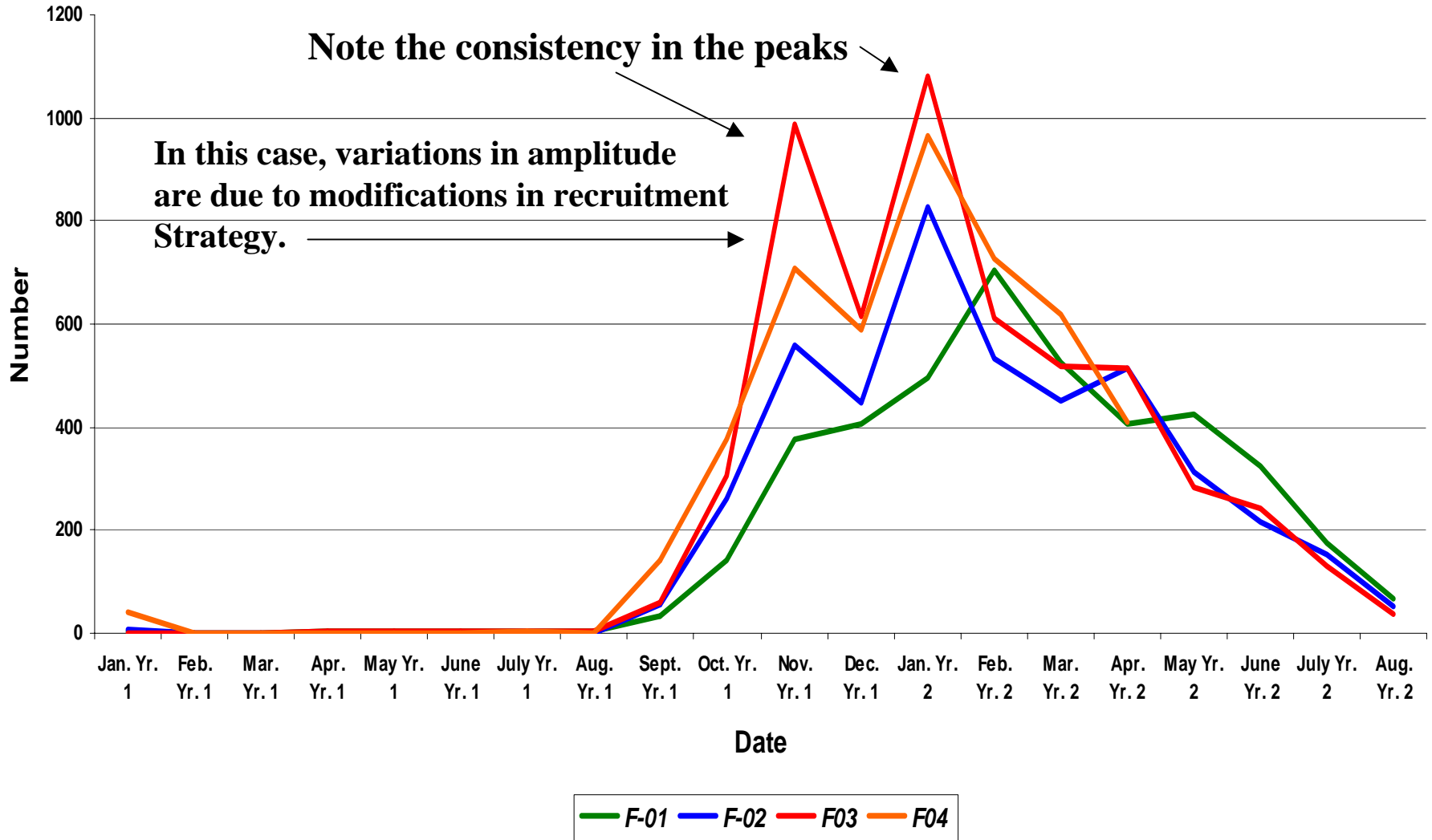
Applications by Student Classification for Fall 2002



ESTABLISH RELATIVE STABILITY

Focusing on Incoming Freshmen

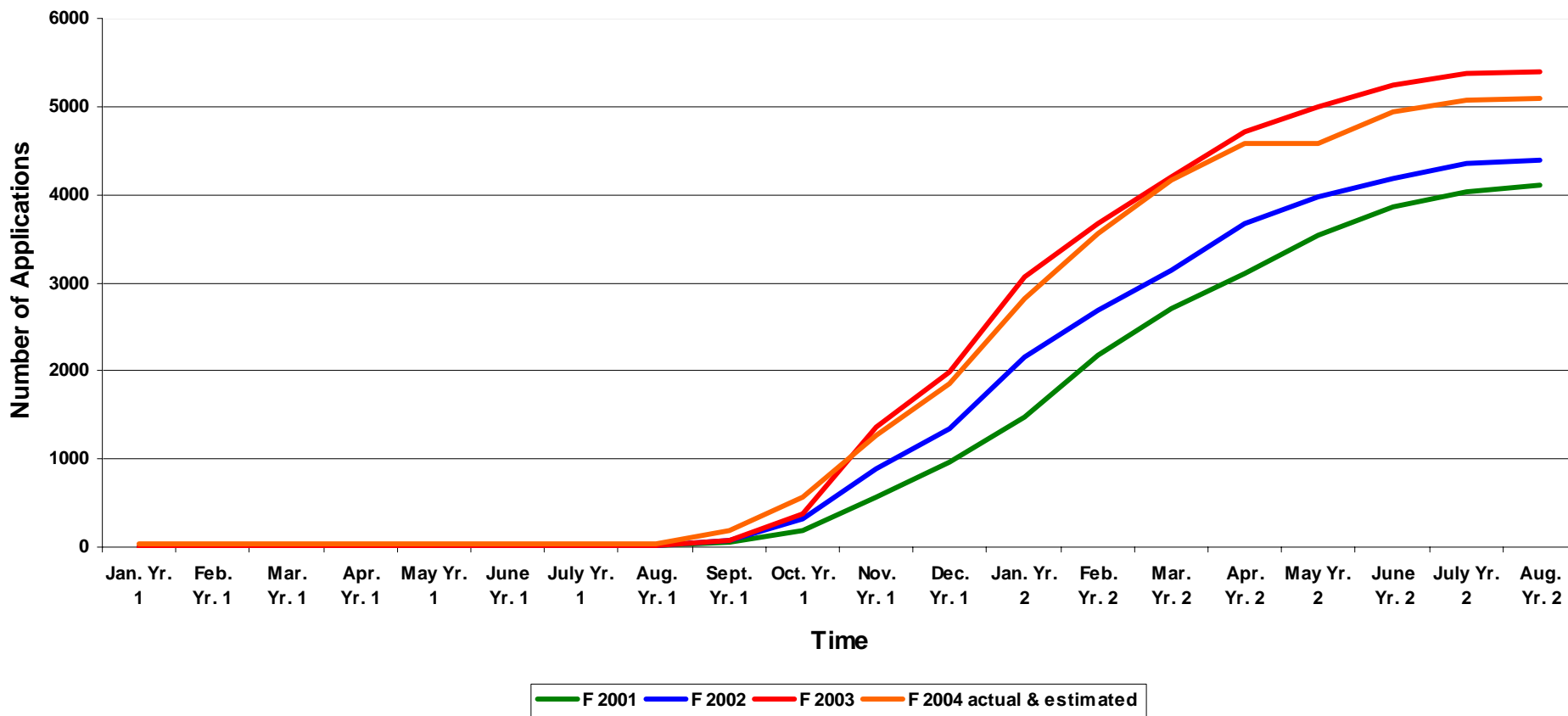
Freshmen Applications for Fall Semesters, 2001, 2002, 2003
and Fall 2004 to April 2004, by Date of Application



Establish Cumulative Application Trends

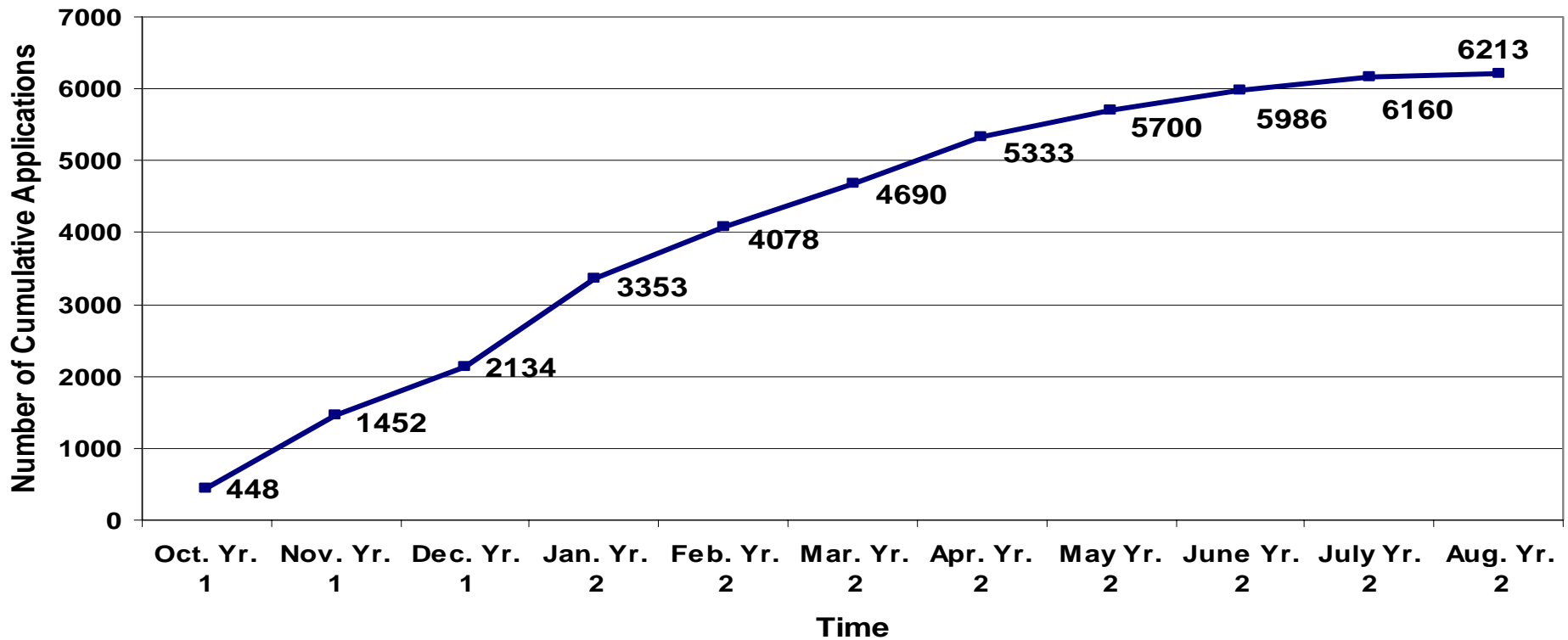
Focusing on Incoming Freshmen

Freshmen Applications for Fall Semesters 2001 to 2003
and Estimated for Fall 2004



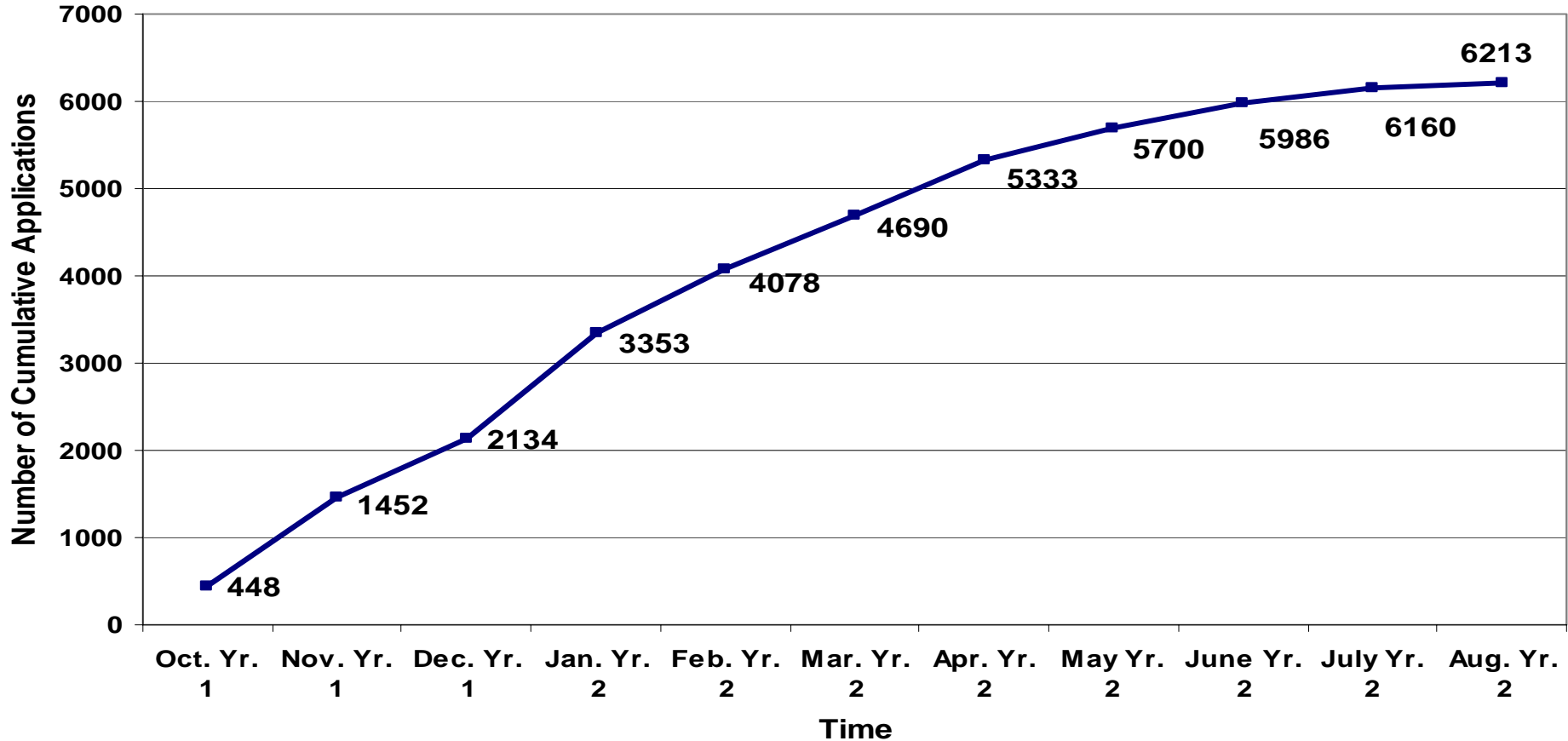
These cumulative trend lines will be used to construct an applications-admissions-enrollment target, and a forecasting line. See next slide →

Application Targets Based on Prediction Line and a Target Enrollment of 1,300 based on a matriculation rate of 21% for Freshmen for Fall 2004



This chart represents: a need for 6,213 applications to achieve 1,300 enrolled new freshmen based on the assumption that the 6,213 applications will yield 21% actual enrollment of freshmen with the student characteristics desired by the university ($6,213 \times .21 = 1304$). Continue to next slide for more information →

Application Targets Based on Prediction Line and a Target Enrollment of 1,300 based on a matriculation rate of 21% for Freshmen for Fall 2004



This chart also represents a means to track the application process to measure whether or not recruitment efforts are meeting, lagging or exceeding time relevant targets.

The chart will be used to create a forecasting on the next slide. Continue to next slide for more information. —————>

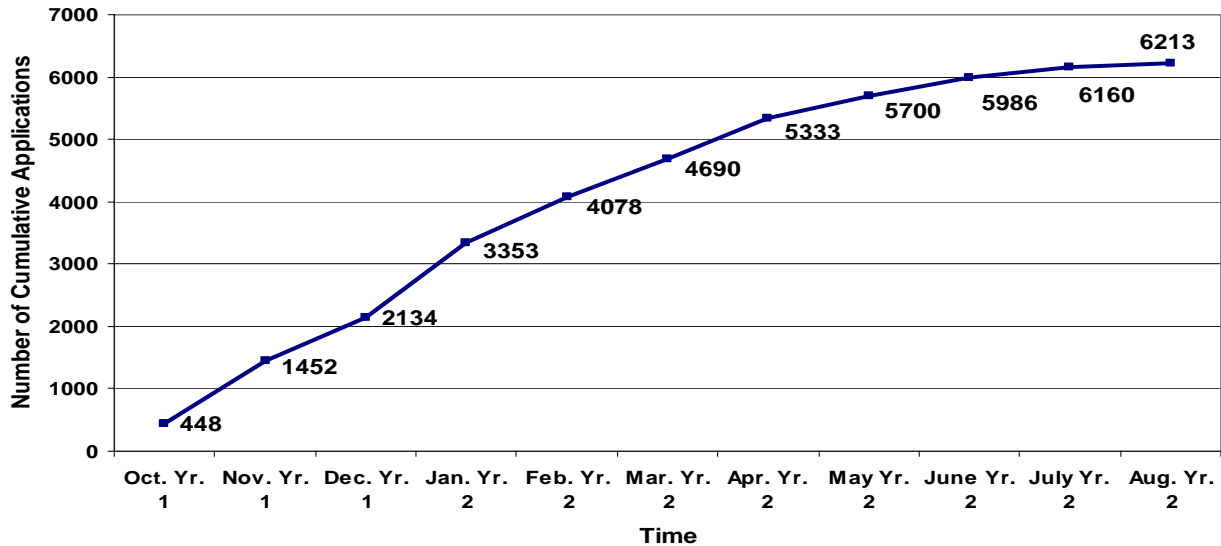
ESTABLISH RELATIVE STABILITY “SMOOTHING INTERNAL ALTERATIONS”

- 1. The forecasting line SHOULD attempt account for INTERNAL changes in recruitment practices. This is easier said than done!**
- 2. An accepted method for smoothing minor alterations in processes is to use a weighted average to establish the prediction lines and transitional probabilities.**
- 3. By monitoring activity patterns in the recruitment area, we can contextually establish “weights” for the variables in the average.**
- 4. The weighted average plus the performance target enrollment, assuming constant applications-admissions-matriculation probabilities, yields a prediction line for applications needed.**
- 5. In the next slide, the forecasting line is based on a weighted average of fall 2002 at .33 and fall 2003 at .66. This is based on what we know about recruitment practices, scholarship packages, etc...**

**Fall 2004 Prediction Line with State Multipliers Based on a Weighted
Average Model:
 $\frac{F02 + 2(F03)}{3}$**

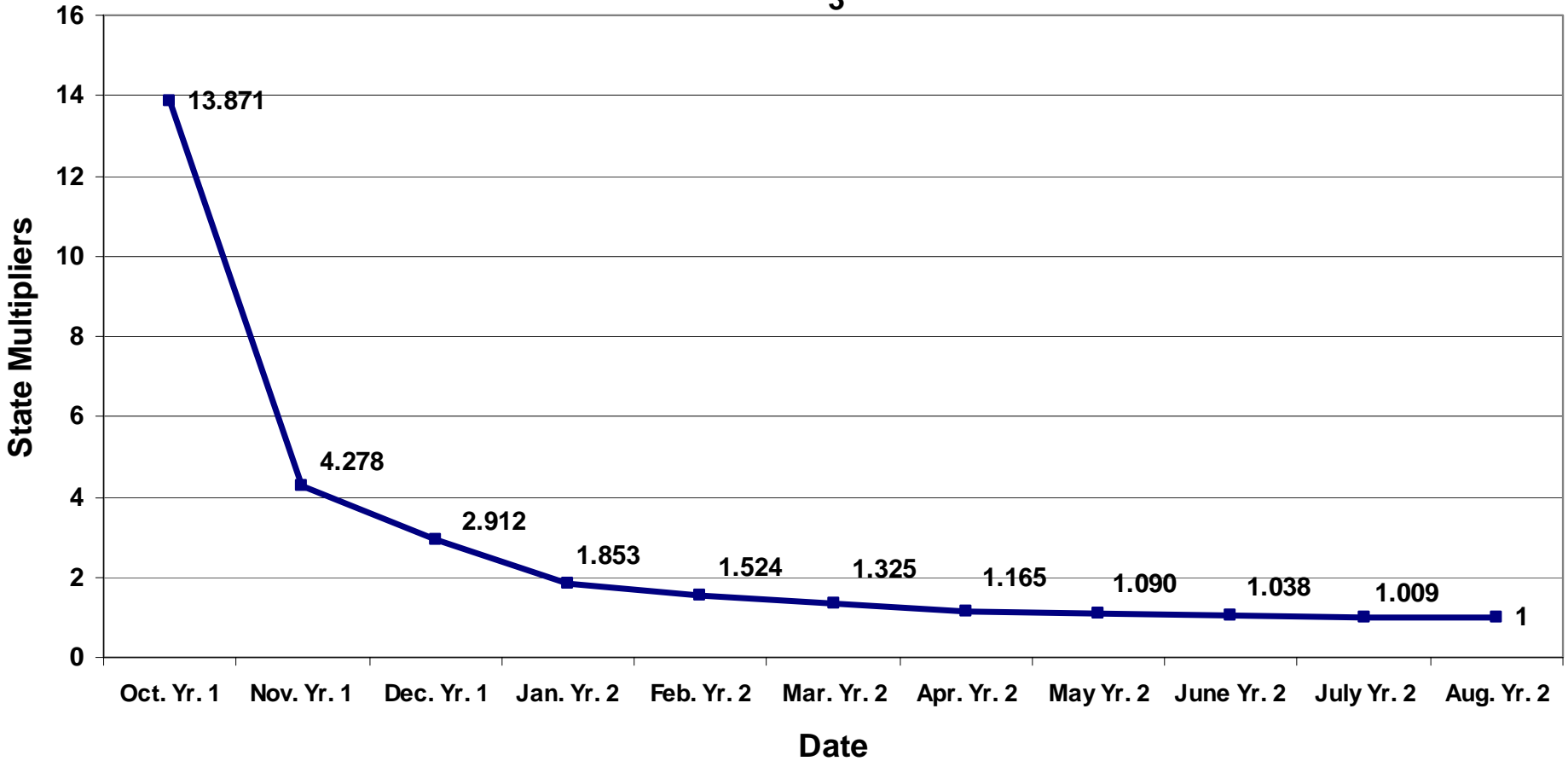


**Application Targets Based on Prediction Line and a Target Enrollment of
1,300 based on a matriculation rate of 21% for Freshmen for Fall 2004**



**Fall 2004 Prediction Line with State Multipliers Based on a Weighted
Average Model:**

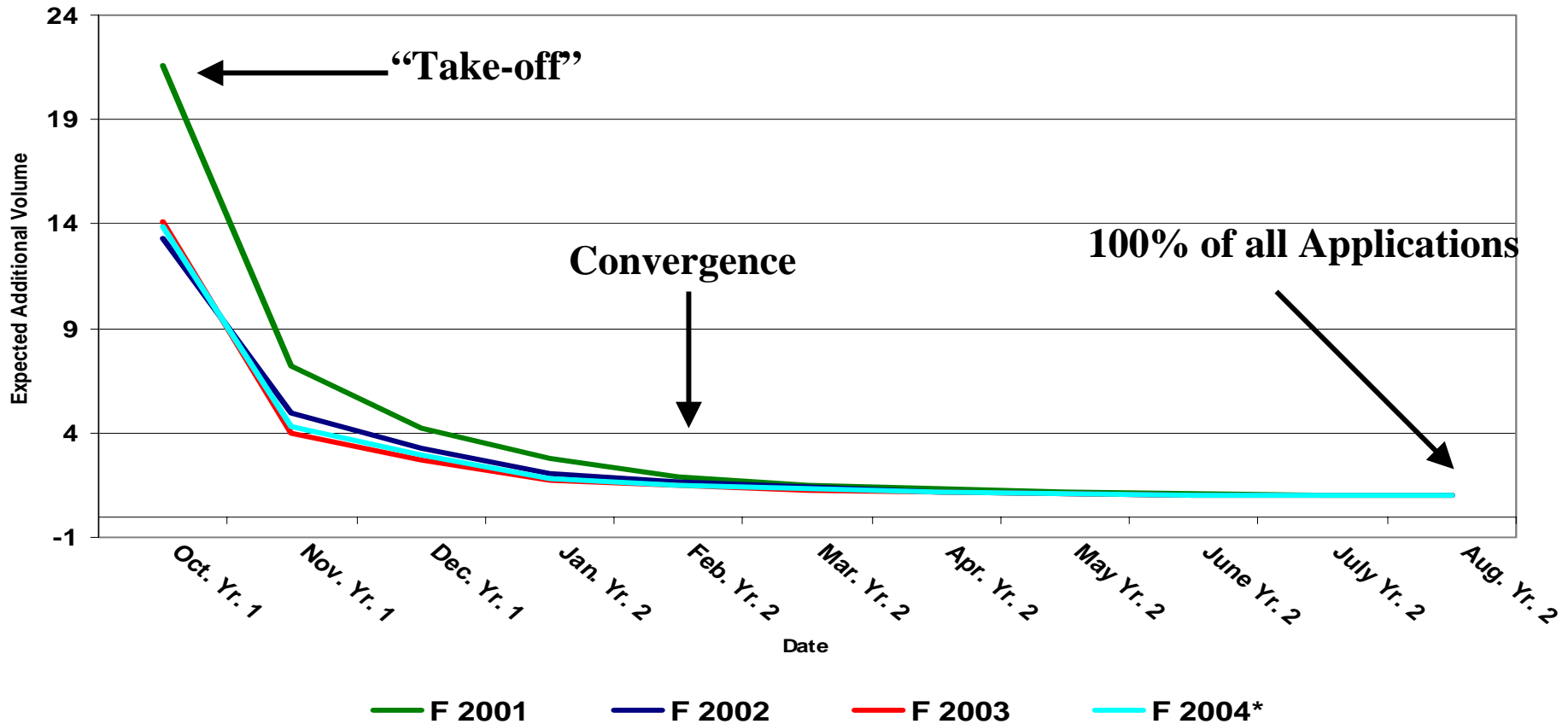
$$\frac{F02 + 2(F03)}{3}$$



$$\Sigma A^f = (a^{t1,2,...n})(m^{t1,2,...n})$$

Where A^f = total applications; a = applications at time 1...n, and m = state multiplier at time 1...n

Prediction Lines based on Rolling Probabilities for Freshman, Fall Semesters 2001-2003 and Target Line for Fall 2004



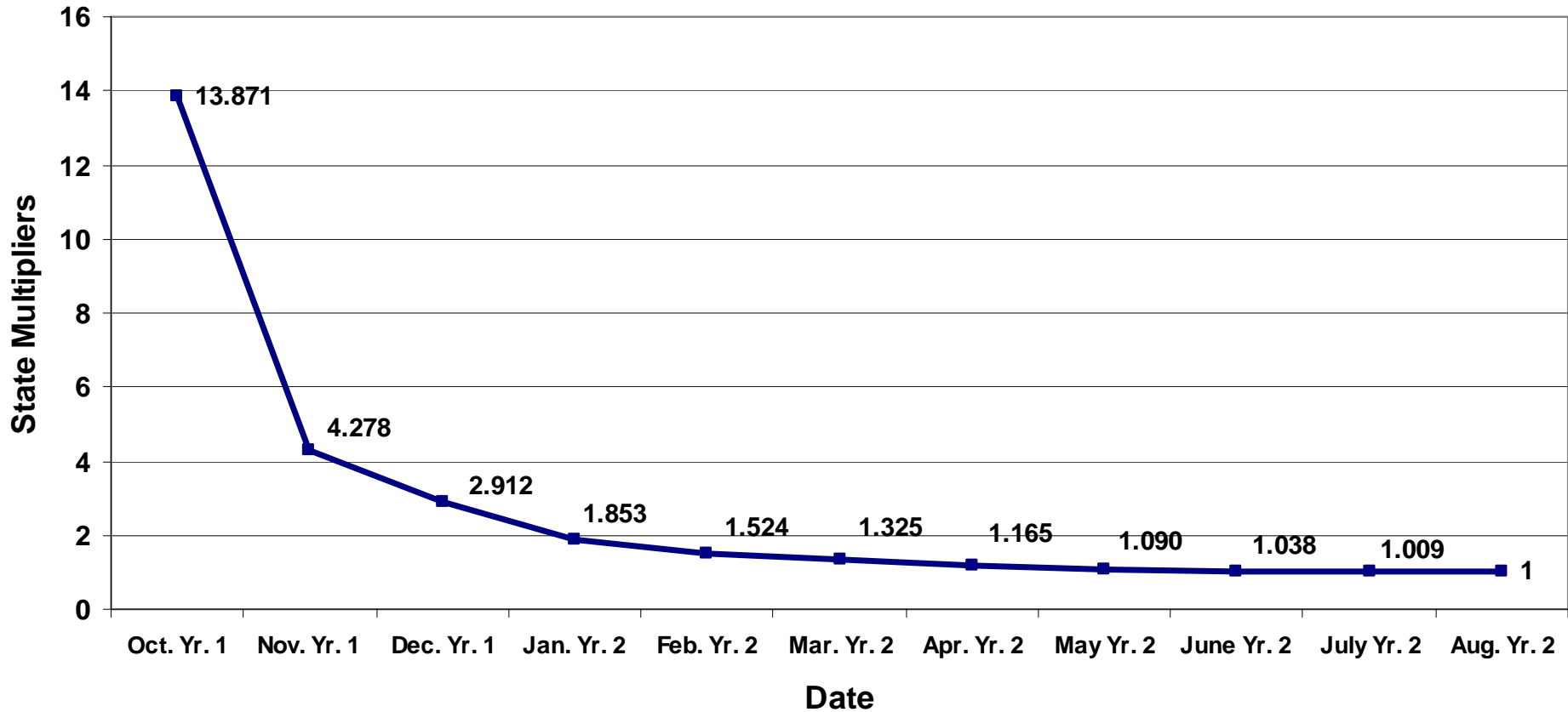
Here we see how the real data for past semesters and the prediction line coincide.

The Forecasting line again

Fall 2004 Prediction Line with State Multipliers Based on a Weighted

Average Model:

$$\frac{F02 + 2(F03)}{3}$$



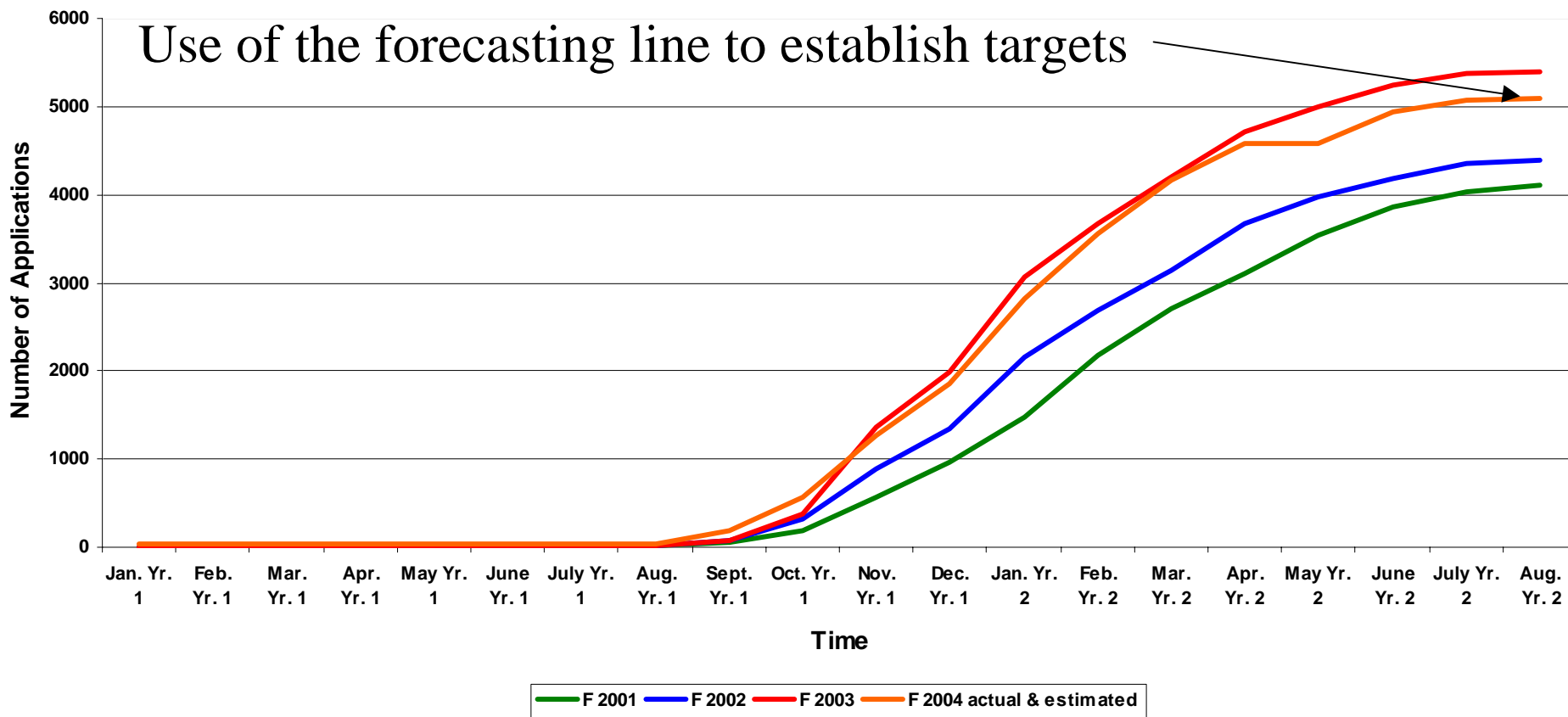
$$\Sigma A^f = (a^{t1,2,\dots,n})(m^{t1,2,\dots,n})$$

Where A^f = total applications; a = applications at time 1...n, and m = state multiplier at time 1...n

Establish Cumulative Application Trends and Performance Targets

Focusing on Incoming Freshmen

Freshmen Applications for Fall Semesters 2001 to 2003 and Estimated for Fall 2004



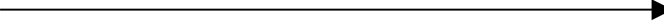
Anticipating and Accounting for Variations in Matriculation Rates

The following slide shows the number of needed applications based on a change in the assumed rate of matriculation.

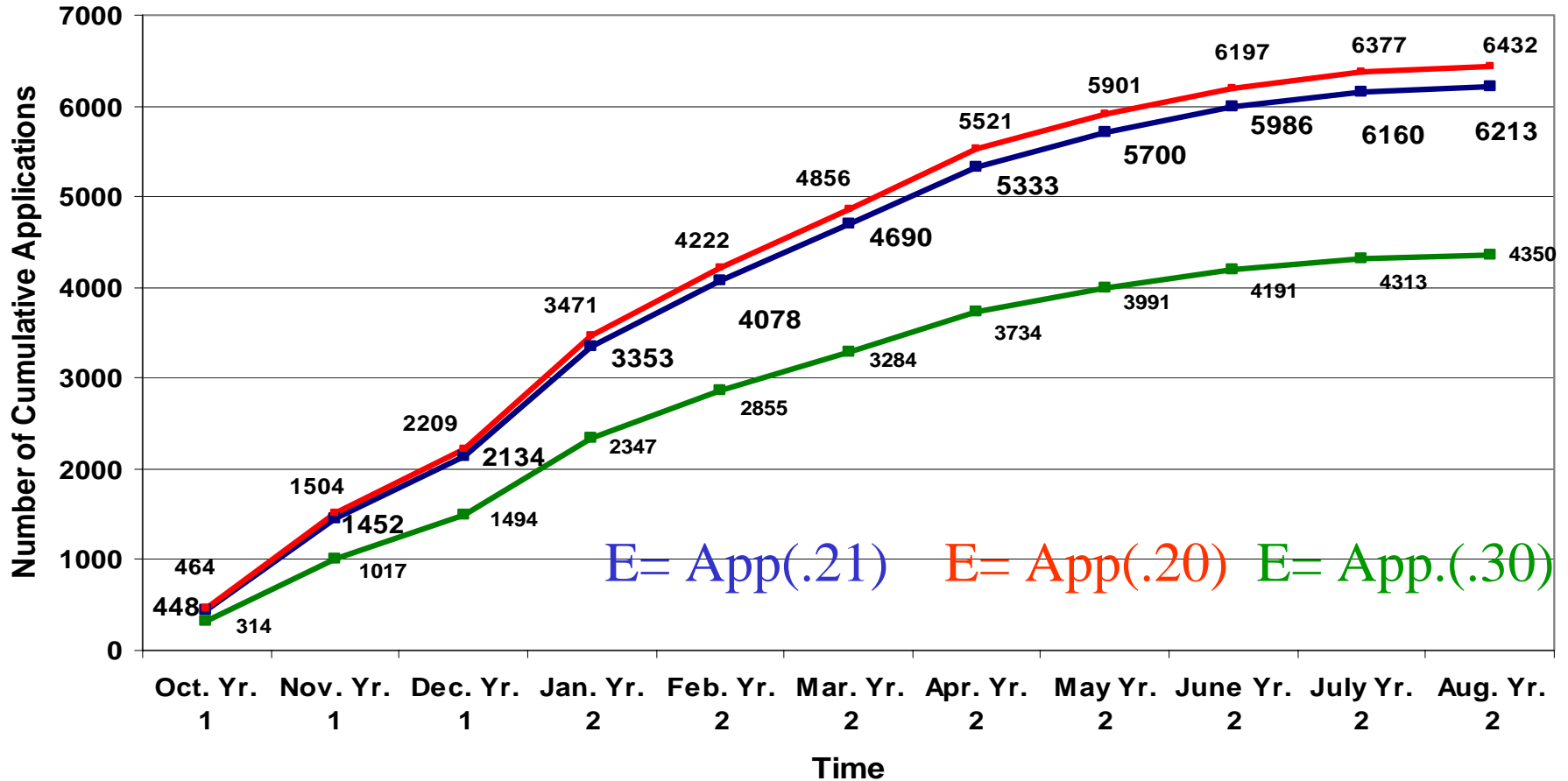
If, for example, as a result of a tuition increase the rate of matriculation declines from 21% to 20%, an additional 219 applications will be needed to meet the goals of 1,300 new, enrolled freshmen.

On the other hand, if, for example, newly instituted financial aid programs and enhanced aid packages, raise matriculation to say 30%, a lower target can be established.

In general, matriculation rates vary by classes of institutions—from highly selective to open admissions— but for any institution, a forecasted rate can be established based on historical data and altered based on local knowledge.

SEE NEXT SLIDE. 

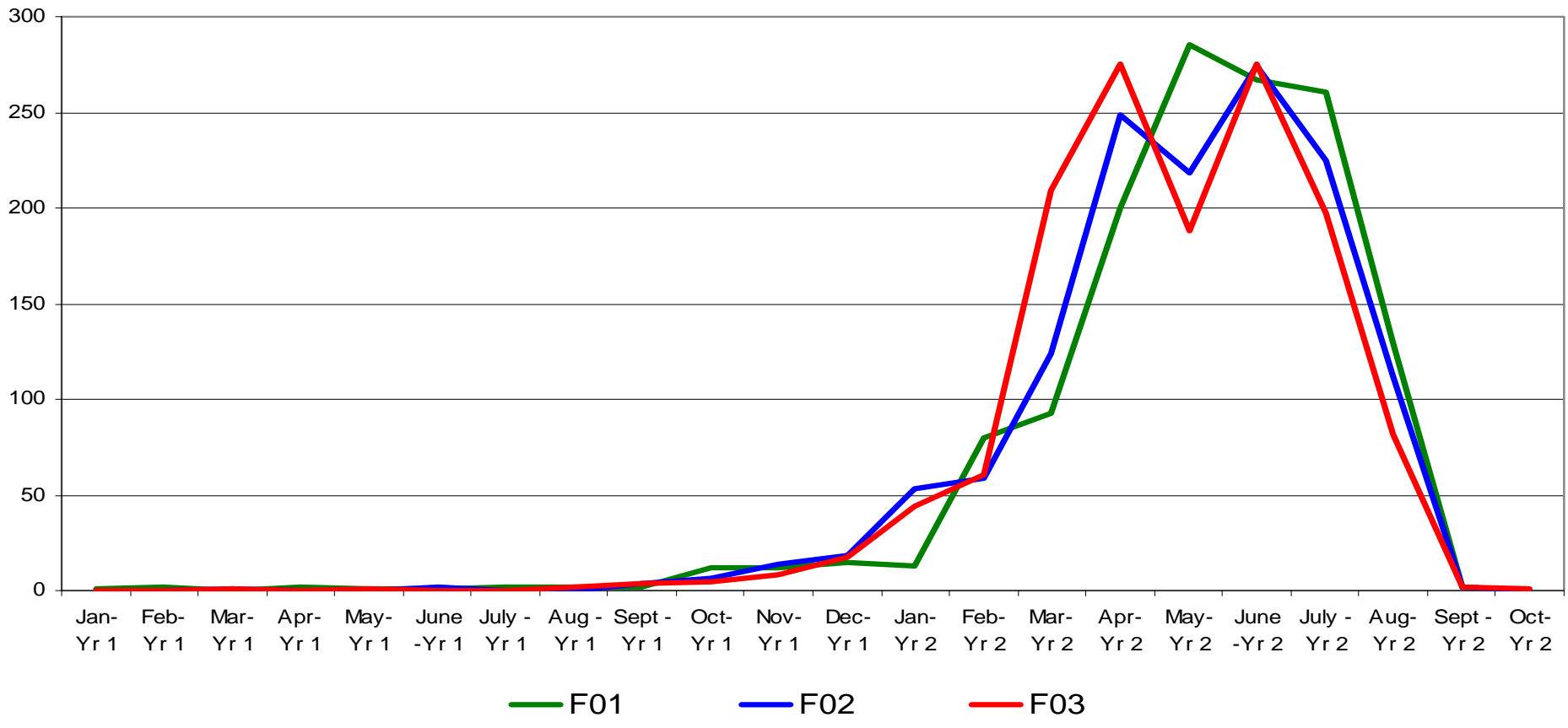
Application Targets Based on Prediction Line and a Target Enrollment of 1,300 Freshmen for Fall 2004 Assuming Constant Admissions Rate (43%) and Variable Matriculation Rate



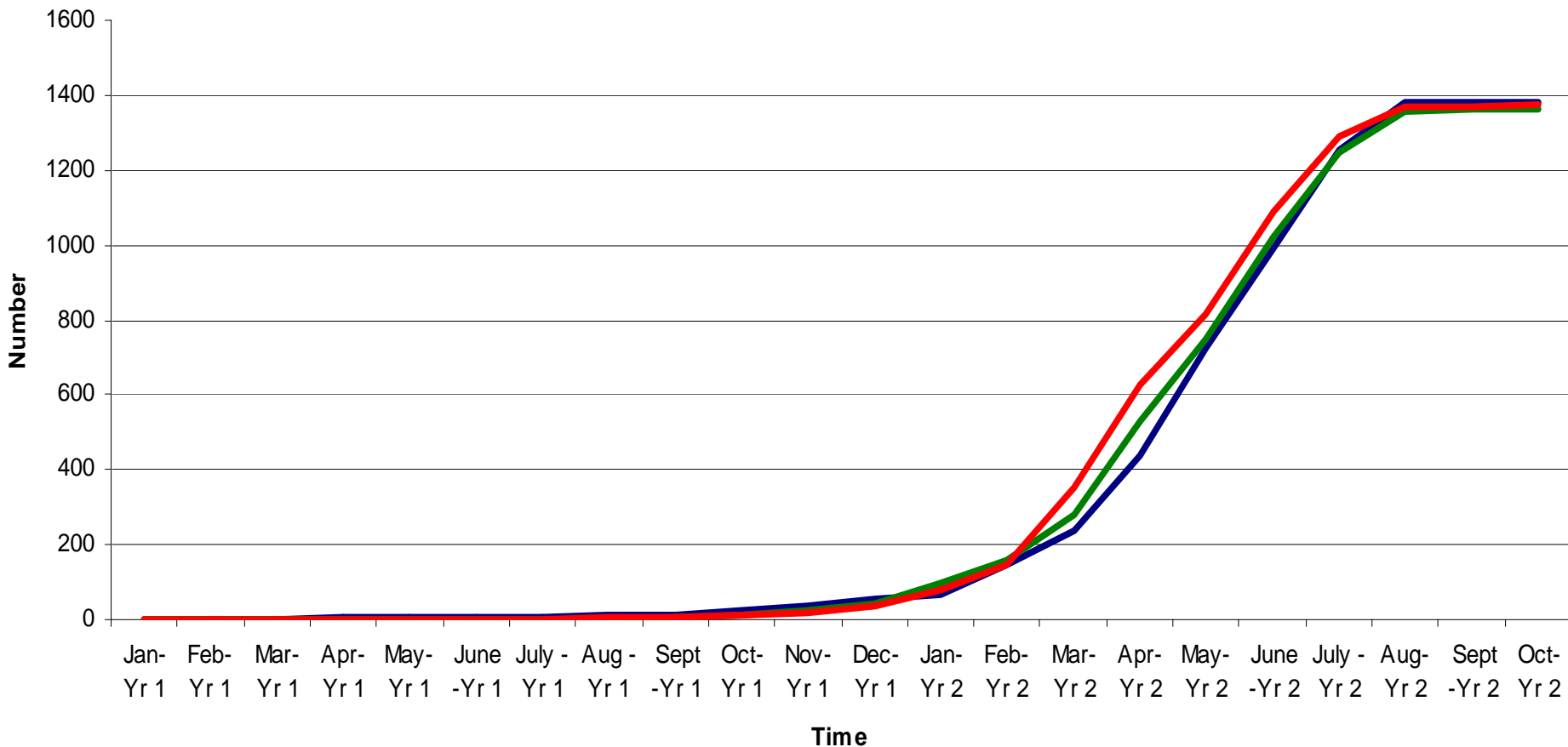
If the assumed matriculation rate is 20% (perhaps due to increases in tuition), the number of applications needed, jumps from 6,213 to 6,432. If for example, because of increases in student aid, the matriculation rate is 30%, the number of applications needed is reduced to 4,350. The point is that one must understand the contextual issues underlying yields in any academic year.

The Procedures we have been describing can be used on other student application categories. Below are charts of Junior applications.

Junior Applications by Application Date

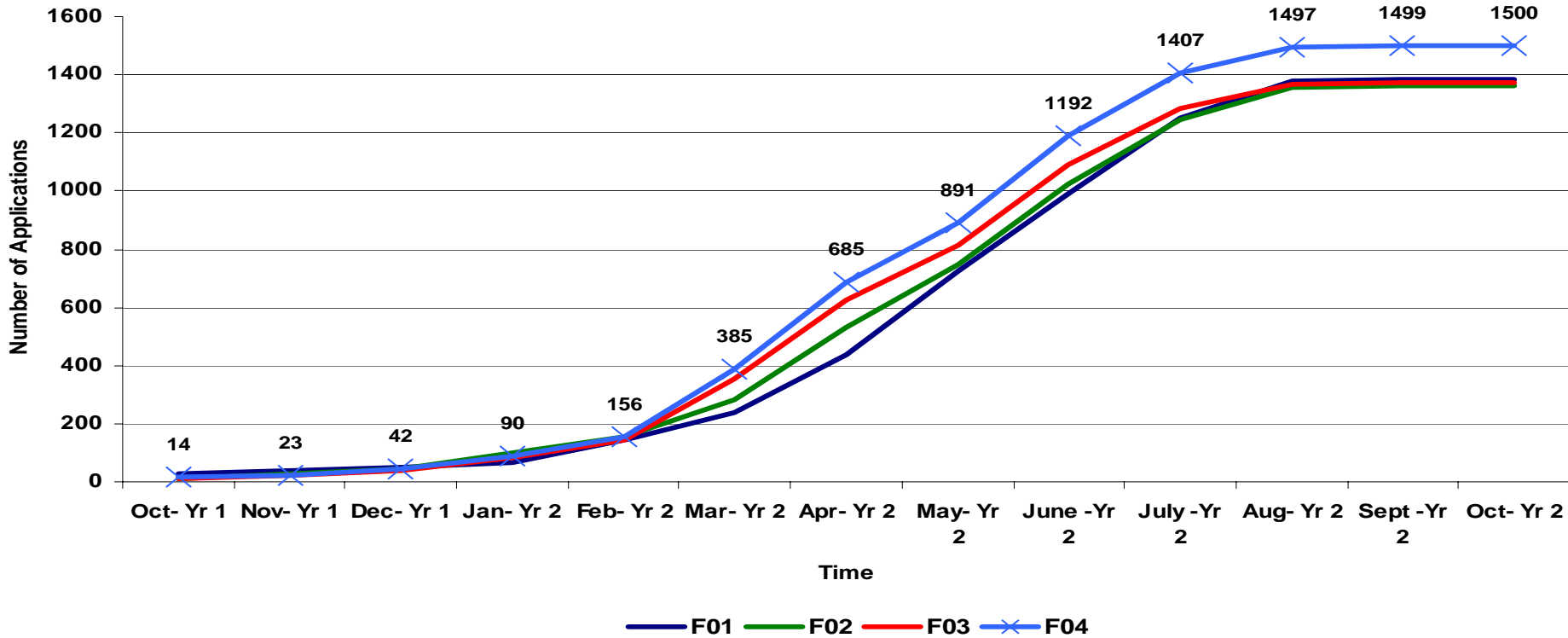


Cumulative Junior Applications For Fall Semesters 2001, 2002 and 2003



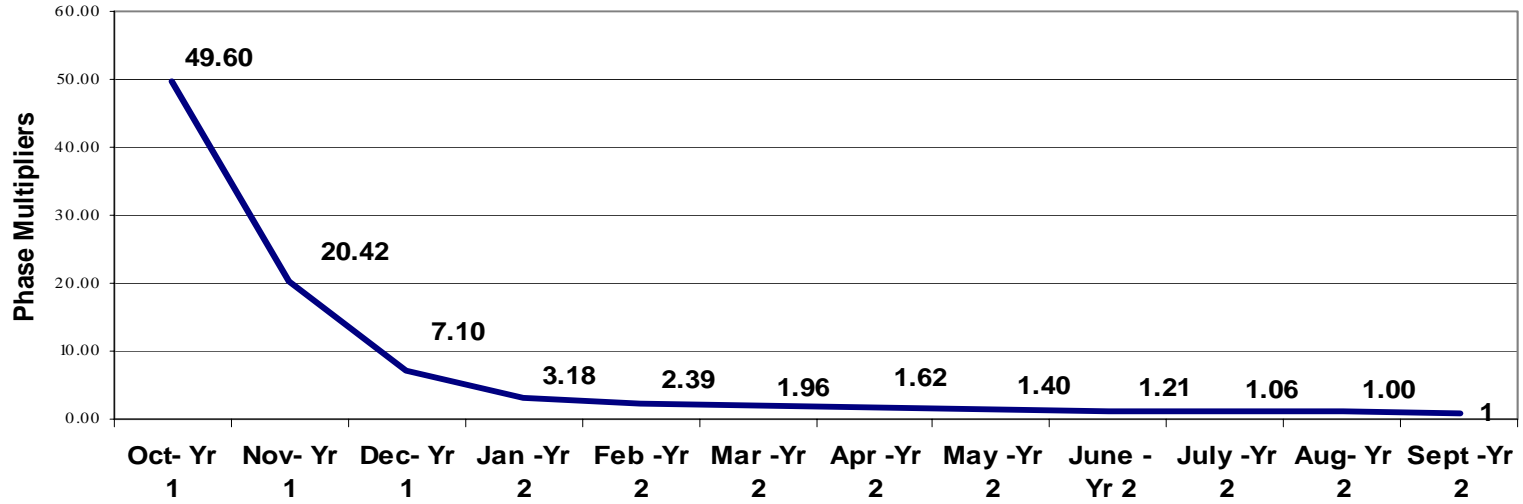
F01 F02 F03

Cumulative Junior Applications For Fall Semesters 2001,2002, 2003 and F04 Target

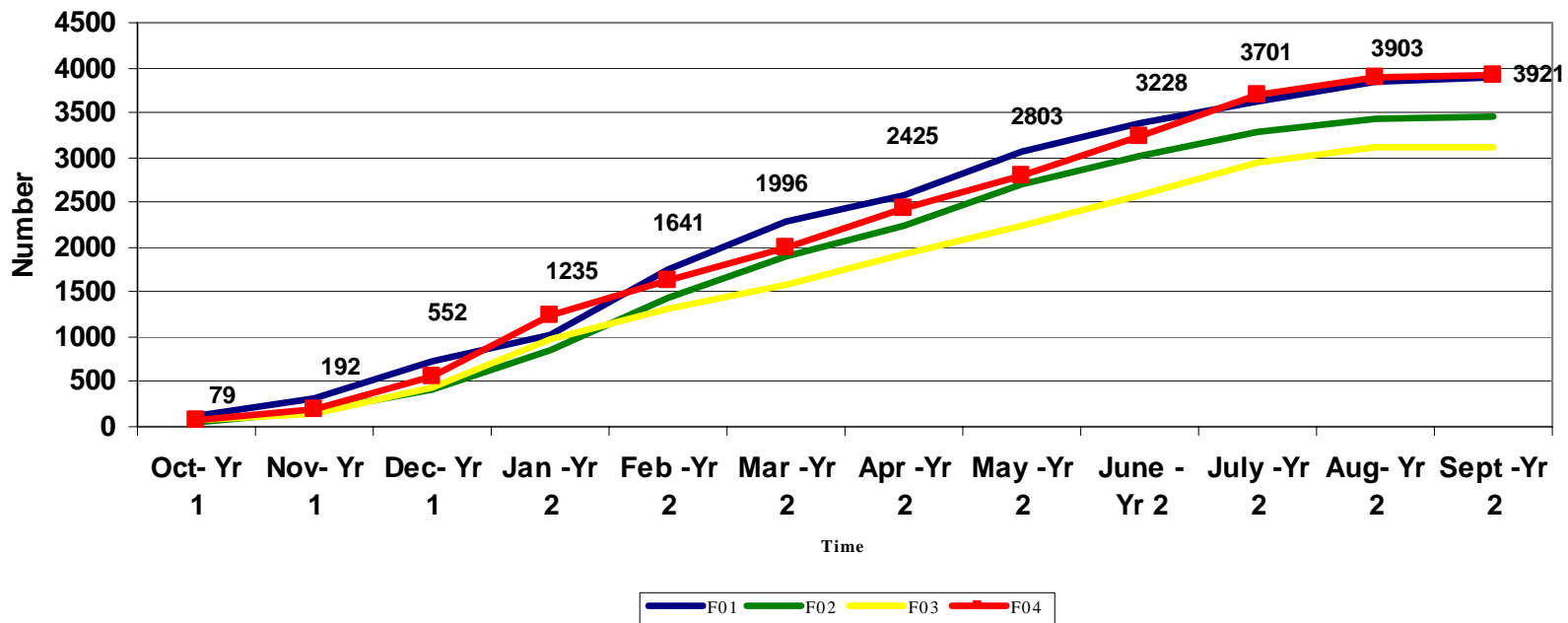


The Procedures we have been describing can be used on other student application categories. Below are charts for Masters applications.

Forecast Line For F04 Masters Applications



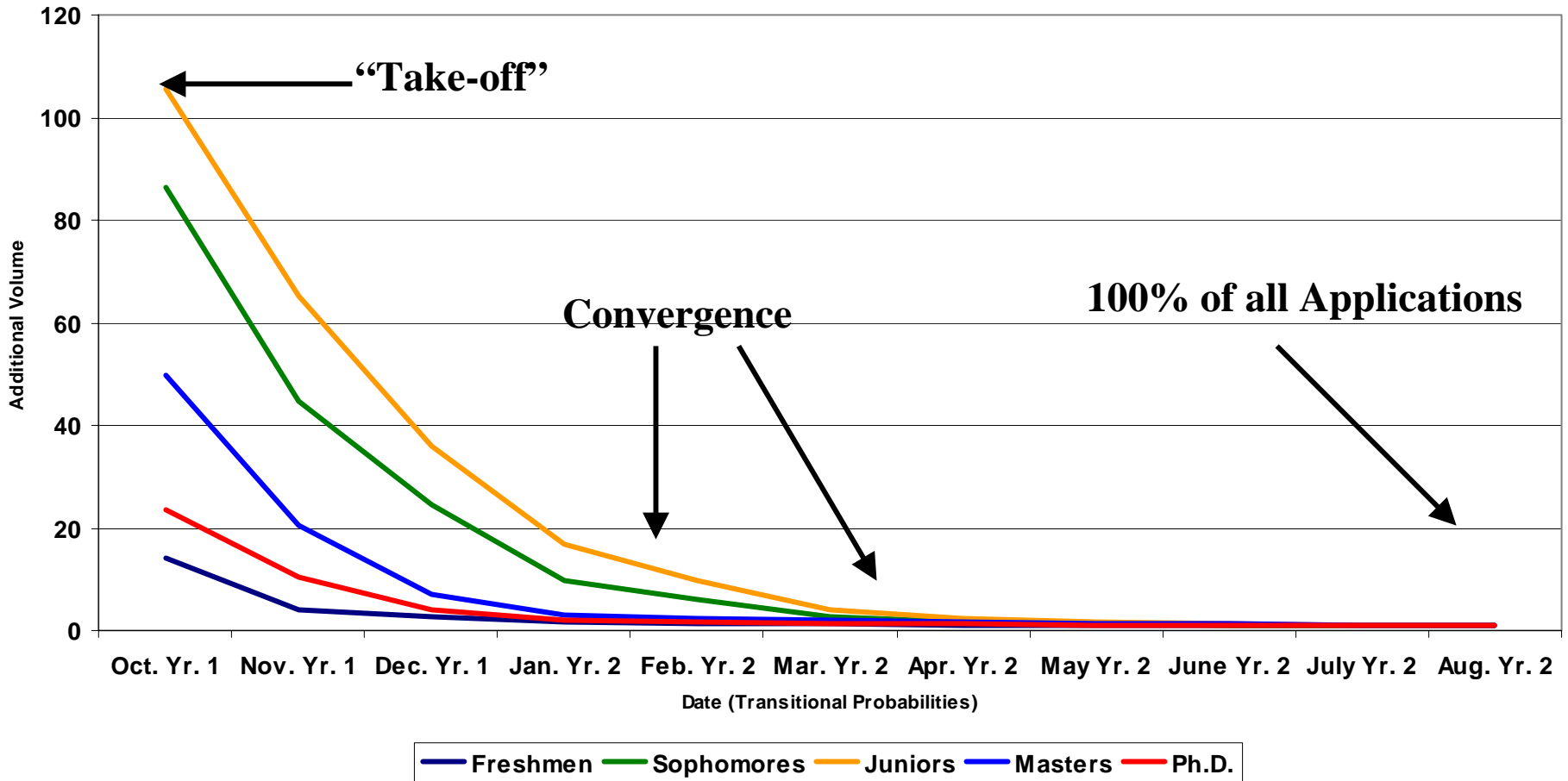
Applications Masters F01-F03 and Target F04



F01 F02 F03 F04

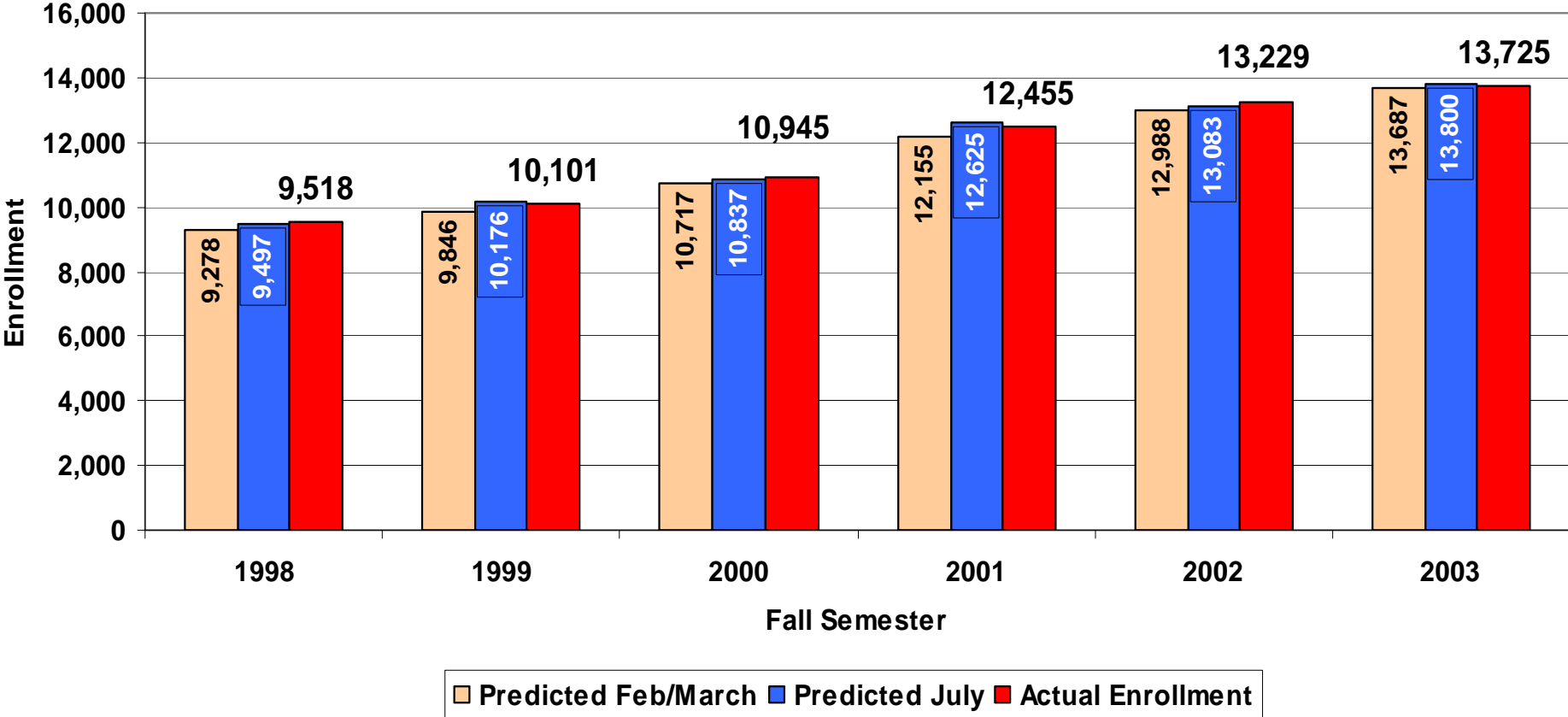
This slide shows the prediction lines for 5 student classifications at their individual “take-off” points and their “convergence” points.

Prediction Lines for Selected Applications by Student Classifications, Fall Semester 2003



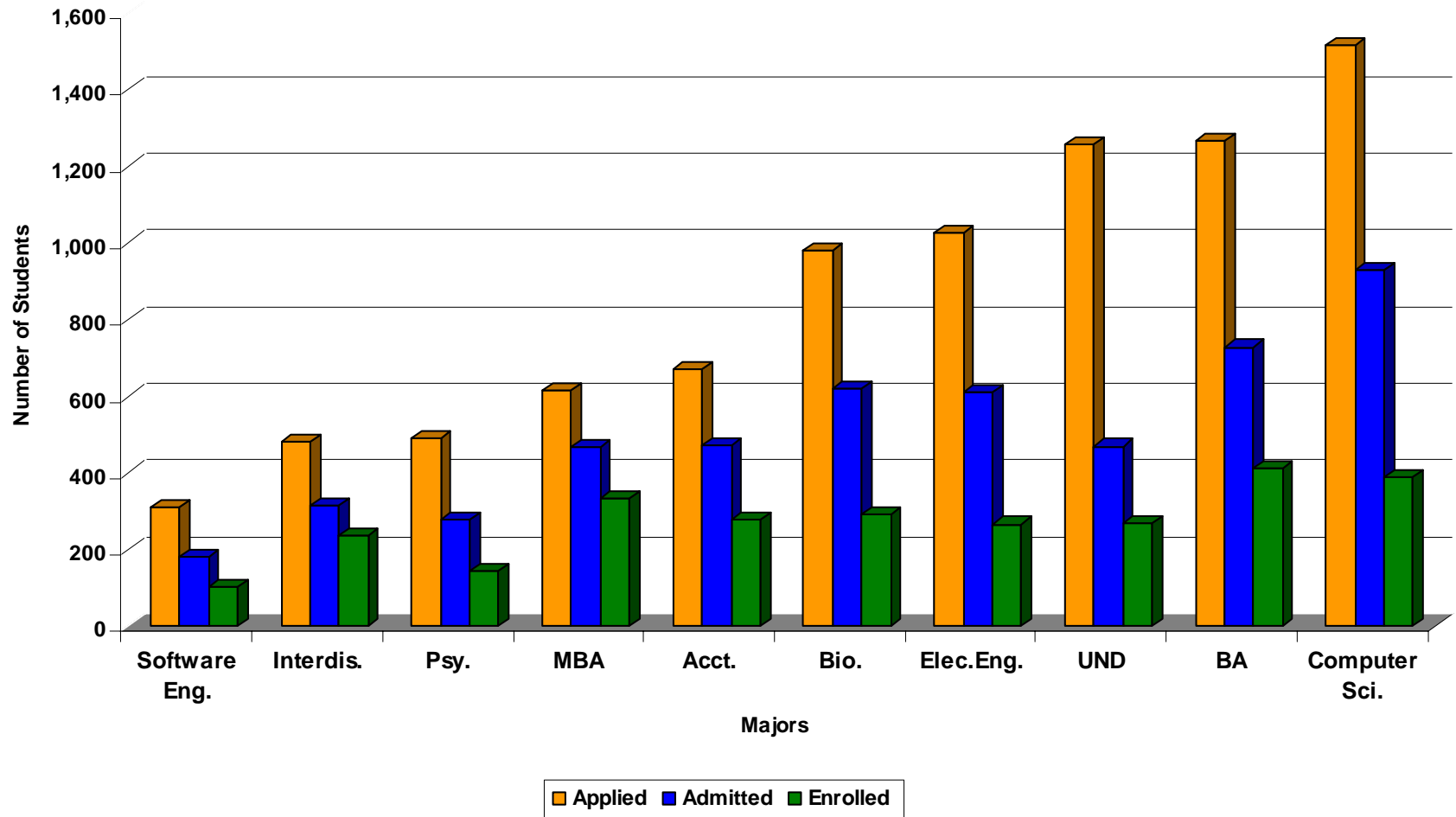
Does it work?

Predicted Versus Actual Enrollment for Fall Semesters 1998-2003



The Top Ten Areas Account for 65% of all Applications and 32% of the New Fall Semester Enrollees

Application to Enrollment Sequences for
Top Ten Majors listed by Applicants, Fall 2003



One can use the same procedures to establish target for specific areas.

Three “Simple” Steps

1. Accurately estimate the Number of Continuing Students (C)
2. Estimate “Output and Loss” (O)
3. Accurately estimate the Number of New Students (I)

With enough lead time to allow organizational adaptations should they be needed.

$$\mathbf{E} = \mathbf{I} + (\mathbf{C} - \mathbf{O})$$

1. Establish if persistence is a stable element or if there have been changes in persistence; establish the best data unit for estimation (fall-spring).
2. Establish Trends and/or Changes in Matriculation Rates.
3. Establish Input Streams, their periodicity and relative stability.
4. Account for internal changes in recruitment and retention strategies.
5. Establish Cumulative Application Trends. Smooth when appropriate.
6. Set Performance Targets. Create alternative targets based on differing assumptions about persistence, admissions, and rates of matriculation. Monitor the capacity of key majors.

