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ABSTRACT

The spiraling cost of higher education has led to questions of accountability and cost effectiveness and called more attention to budgetary and financial structures. This shift in decision-making responsibilities is closely tied to recent changes in enrollment growth that has reached a static or declining stage. In view of this trend, administrators must be able to assess enrollment patterns more carefully. This paper covers the following topics of analysis with an example of applications to a large, urban public university: (1) identification of past seasonal, cyclical, and trend variations in enrollment; (2) correlation of cyclical enrollment variation with the business cycle; and (3) use of the information from (1) and (2) to develop a simple regression model to predict short-run variations. The model is even more useful in focusing administrators' attention on the need for policy assumptions in even the most sophisticated, long-range projections. (Author/LBH)

HELPING ADMINISTRATORS IDENTIFY SHIFTS

IN ENROLLMENT PATTERNS

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ABSTRACT

Helping Administrators Identify Shifts
in Enrollment Patterns

The spiraling cost of higher education has led to questions of accountability/cost-effectiveness, and called more attention to budgetary and financial structures. This shift in decision making responsibilities is closely tied to recent changes in enrollment growth that has reached a static or declining stage.

Administrators must understand these changes and project further enrollment variations for budget, staffing, and space allocation purposes. A study of quarterly credit hour enrollment can reveal definite and divergent patterns among the schools that make up the university. Using traditional methods of time series analysis, recurring seasonal and cyclical variations are established so that quarter-to-quarter changes can be anticipated.

Such studies should assist administrators to identify those current enrollment variations that are truly novel. Variations that break the established pattern may indicate a trend change which warrants administrative action either to adjust to the new trend or to counter the change in trend.

The paper covers the following topics of analysis with an example of applications to a large urban public university:

1. Identification of past seasonal, cyclical, and trend variations in enrollment.
2. Correlation of cyclical enrollment variation with the business cycle.
3. Use of the information from (1) and (2) to develop a simple regression model to predict short-run variations. The model is even more useful in focusing administrators' attention on the need for policy assumptions in even the most sophisticated long-range projections.

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I. INTRODUCTION AND PURPOSE

Current and projected enrollment figures are an essential consideration in planning the university's staffing, space, and budget requirements. In the 1976 fall quarter, student enrollment (expressed in terms of credit hours) declined to 188,889; down 4.1 percent from the 196,995 level of the previous fall.

An additional decline in credit hours taught in the winter quarter, 1977, raises the question of whether or not these successive declines indicate a future downward trend. Such a development would have great impact on a university which has grown steadily and substantially for many years.

In contrast, no such question was raised when an enrollment decline of greater magnitude -- almost 30 percent -- occurred in the preceding summer quarter of 1976. This is because the most recent enrollment figure, and what it portends for future quarters, is usually judged against a pattern of expected behavior based largely upon observed past patterns. In this instance, the summer quarter enrollment fall-off raised no questions because the decline was no more than the expected seasonal variation. It is a common anticipation that total credit hour enrollment is down every summer.

In order to establish an empirical basis of such expected enrollment behavior, this study examines the pattern of enrollment variations at GSU over the past ten years. The result is not a rigorous predictive model of future enrollment behavior. Indeed, quarter-to-quarter changes in any historical series are largely random. Nevertheless, a thorough understanding of past enrollment patterns can help identify those current enrollment variations that are truly novel and bear a closer look. Such variations that break the established pattern may indicate a trend change which warrants administrative action either to adjust to the new trend or to counter the change in trend.

Moreover, a familiarity with past enrollment patterns may be helpful to the Deans and Vice Presidents who make the annual enrollment forecast for budget purposes. The identification of enrollment variations that recur in a stable manner permits their removal from discussion.

For instance, if there is a stable relationship between fall quarter enrollment and winter, spring, and summer quarter enrollments every year, only the fall quarter figure need be projected. The figures for the remaining quarters would be a matter of arithmetic. Three-fourths of the numbers are thus struck from active deliberation. Forecasters can then focus their judgment on the more volatile trend elements whose behavior must be explicitly assumed for the projection period.

II. PLAN OF THE STUDY

The study applies the classical method of time series analysis to GSU credit hour enrollment data. This method separates the variations over time into a pattern of four types of change. These are short-term seasonal variation, long-term trend variation, an intermediate-term cyclical variation, and one-time variations that occur randomly.

In the case of university enrollment, the seasonal variation, if any, would occur quarterly. The trend variation would be the historical growth path. The cyclical variation, again if any, might relate to the cyclical behavior of the economy. And, finally, random variations would be unique events such as the initiation of a new academic program or non-degree work.

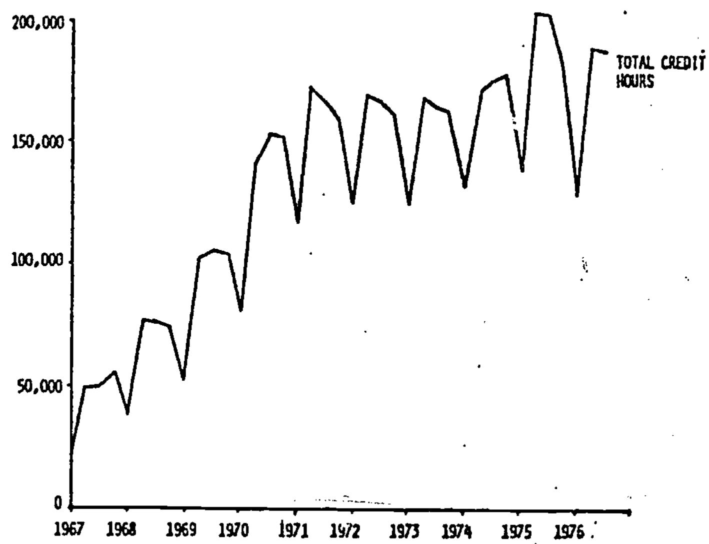
Classical time series analysis first removes the seasonal variation from the data series using a moving average technique. The seasonally adjusted series is then measured for trend variation using a least-squares curve fitting technique. Next, this isolated trend variation is subtracted from the deseasonalized series, leaving residual values whose variation may be cyclical or random. Any evident cyclical behavior in the residual values can be investigated further to see if there is a parallel with cyclical behavior in other time series. If there is a correlation with another series, and if variations in the other series occur earlier in time, this lead-lag relationship can be a useful forecasting tool.

In this step-wise manner, the study first analyzes the variation of total credit hours at GSU to establish the basic patterns. Then the enrollment pattern of each academic school is compared or contrasted with the university's basic pattern. The analysis by school should be of greater use to each dean's office which is especially interested in anticipating its respective enrollment behavior. As a further aid, the analysis by school is broken down into graduate, upper division, and lower division hours.

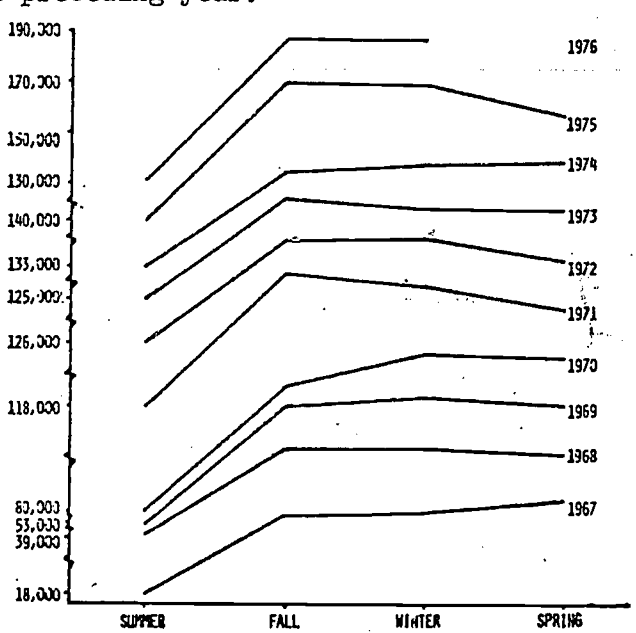
III. ANALYSIS OF ENROLLMENT PATTERNS

A. Seasonal Variation

The chart of total credit hours by quarter from 1967 to 1976 reveals an annual rise and fall in enrollment.



This seasonal rhythm becomes even more apparent when the credit hours are plotted by consecutive quarter so that each year's data is presented tier-wise above that of the preceding year.



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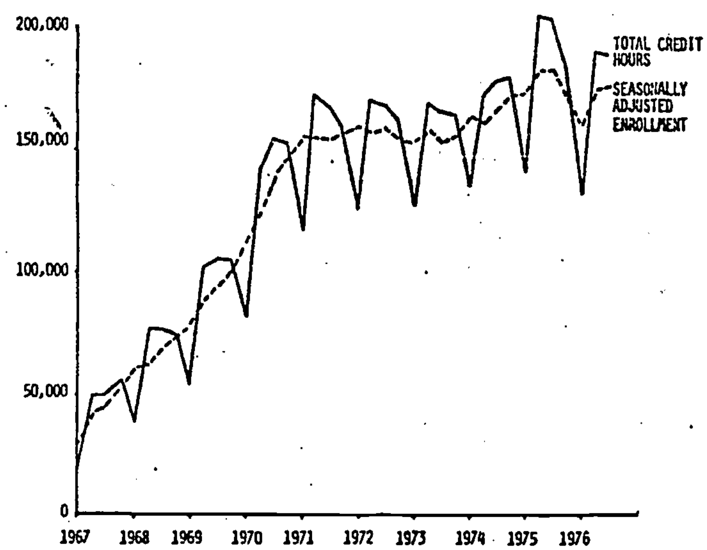
The tier chart reveals that not only is there an annual variation, but that the variation forms a recurring pattern. It appears that credit hour enrollment for the university as a whole is low each summer, rises sharply to a peak in the fall quarter, and then declines somewhat during the winter and spring quarters.

Because of the regularity of the pattern, it is possible to compute a seasonal index of this variation. Dividing each quarter's enrollment figure by the corresponding seasonal index, it is possible to remove, or "adjust for", the recurring seasonal influence (see Appendix A, Columns 1 - 4).



The seasonally adjusted data can then be compared on a quarter to quarter basis and examined for factors other than seasonality that affect the variations.

B. Trend Variation. The first of these other, non-seasonal factors considered is the long-term growth trend. A chart of seasonally adjusted quarterly data reveals that while GSU's enrollment has grown steadily, it has not done so at a constant rate.

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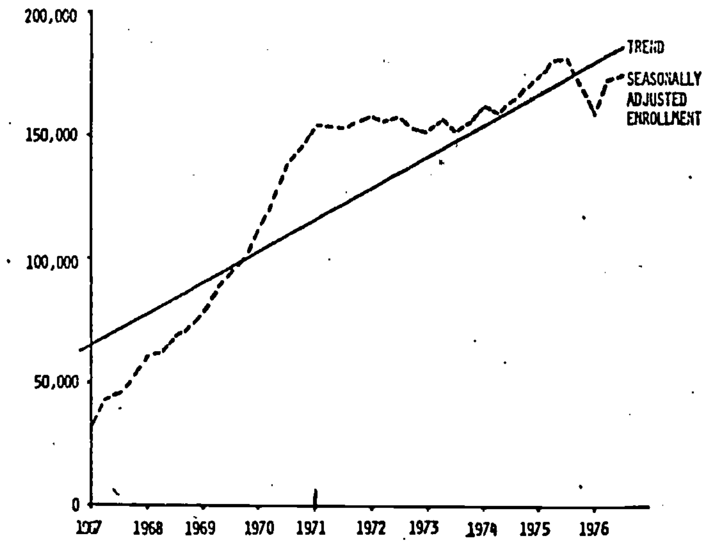
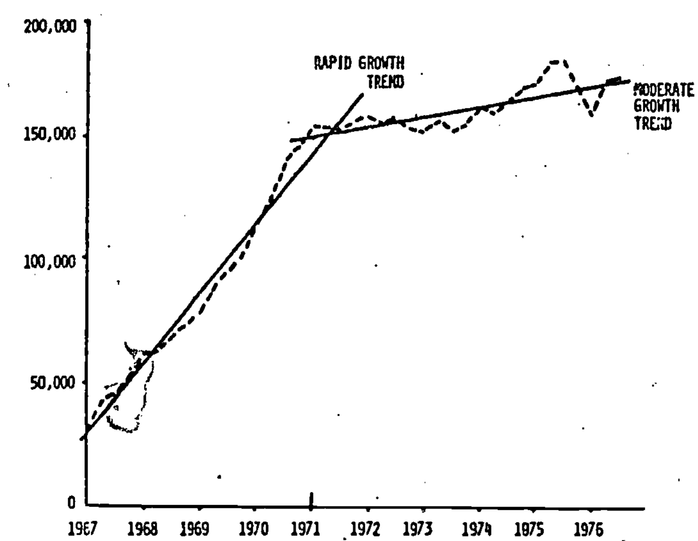
A period of very rapid expansion drew to a close about 1971. There has followed a period evidencing a relatively lower growth rate. Consequently, the data does not conform very well to a single fitted linear trend line.



An earlier GSU enrollment study[1] found that no single curve--not even a more complex logistic growth curve which allows for an initial rapid-growth period--describes the GSU pattern accurately.

A separate trend line for each period appears to have a better "fit", in the sense of minimal variance of actual enrollments from the calculated trend path.



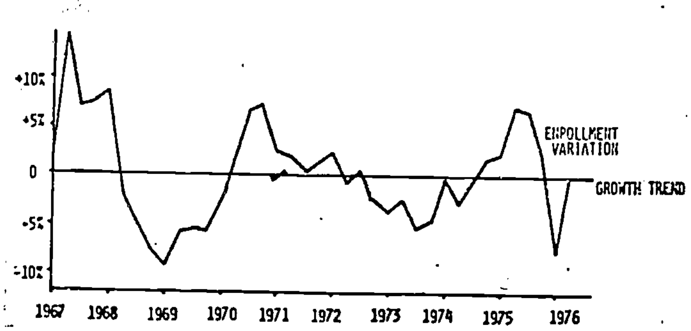
1. James E. Prather, "Estimating Enrollment for 1974-75", OIP, October, 1973.

A more recent enrollment study[2] fitted two exponential trend lines, one for the 1964-1971 period and another for the 1971-1976 period. The present study also breaks the trend at the 1971-summer quarter. However, a linear trend is used for each period because of its simplicity and because the standard error is only marginally greater than that of the exponential curve in each period. The graph illustrates that the data conforms reasonably well to the two fitted linear trend lines.

C. Cyclical Variation

Any discussion of the significance of the trend value for future growth rates is avoided at this point since the trend is fitted primarily to isolate the residual values for closer examination. In the classical analysis, the residuals are variations in enrollment not accounted for either by seasonal factors or by the long-term trend line.

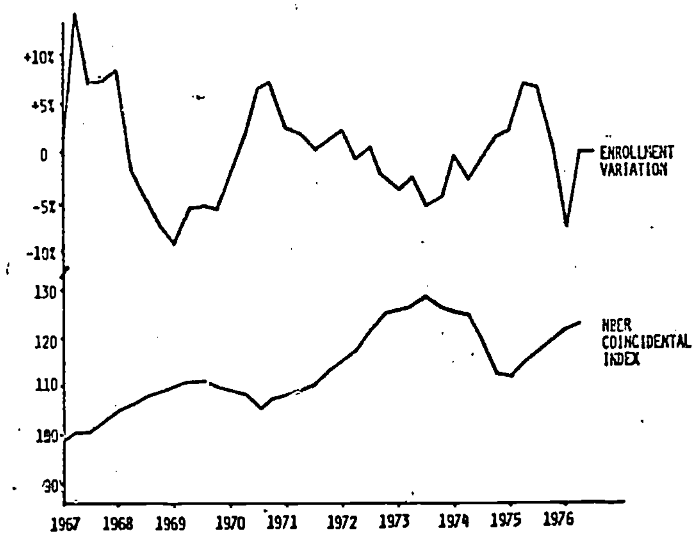
In this case, a definite cyclical pattern does emerge in the total credit hour residual values. (See Appendix A, columns 5 - 7 for actual values.) The residuals' cyclical pattern is visually more apparent if the trend lines are drawn horizontally to emphasize the divergence of the seasonally adjusted credit hour figures from the fitted growth path.



[2] James E. Prather and Glynton Smith, "Enrollment Forecasting at GSU: One Perspective", OIP Report No. 76-5, October 1975.

Enrollment fell below the trend growth from the fall quarter 1968 to the summer quarter 1970 and again from the fall quarter 1972 to the winter quarter 1975.

To see if these quarters of enrollment contraction relate to periods of economic expansion or contraction, the series is compared with the National Bureau of Economic Research's (NBER) index of coincidental indicators. This is an index of time series whose turns in the past have coincided roughly with those of successive business cycles.



The chart suggests that economic activity does affect GSU enrollment variation. However, the relation is inverse, that is, an increase in economic activity appears to have a dampening effect on credit hour enrollment.

This relationship can be measured more precisely. Simple regressions give an exact correlation coefficient between the credit hour residuals and various measures of local, state, and national economic activity. The table shows the results of these regressions.

TABLE OF CORRELATION COEFFICIENTS
(Values may range from .000, no correlation,
to 1.000, perfect correlation)

Quarterly Economic Indicators	Total Credit Hours (% Variation from Trend) 1967-71	1971-76
Atlanta Non-Agr. Employment (% Variation from Trend)		
leading 1 qtr.	-.571*	-.597
same qtr.	-.500	-.742*
lagged 1 qtr.	-.340	-.480
Georgia Non-Agr. Employment (% Variation from Trend)		
lagged 1 qtr.	-.828*	-.556
lagged 2 qtrs.	-.777	-.581*
lagged 3 qtrs.	-.561	-.441
NBER Leading Index		
lagged 2 qtrs.	-.718	-.678
lagged 3 qtrs.	-.725*	-.733*
lagged 4 qtrs.	-.687	-.648
NBER Coincidental Index		
same qtr.	-.722	-.537
lagged 1 qtr.	-.754*	-.659*
lagged 2 qtrs.	-.707	-.632
Georgia Weekly Hours Worked		
lagged 3 qtrs.	-.471	-.607
lagged 4 qtrs.	-.476*	-.649*
lagged 5 qtrs.	-.161	-.433

*highest correlation

As the table shows, the cyclical variation in GSU credit hours correlates highly (though inversely) with the cyclical variation in Atlanta area employment. The relationship holds for both the 1967-71 rapid growth period and for the 1971-76 moderate growth period. Moreover, during the more recent period, the highest correlation coefficient for enrollment variation and Atlanta employment variation is attained during the <u>same</u> quarter. In other words, an increase in Atlanta employment during a particular quarter coincided with a like decrease in GSU enrollment during the same quarter.

The other measures of variation in economic activity also correlate highly with the cyclical variation in enrollment. The closest parallel is the .733 coefficient for the NBER index of leading indicators. In this case, however, the highest coefficient is attained by lagging the index values three quarters. This means that an increase in the index value during a particular quarter coincided with a like decrease in enrollment three quarters later.

This lead-lag relationship has strong potential for short-term forecasting purposes. (See Appendix C) This is especially true for Georgia weekly hours worked in manufacturing. Variation in this data series preceeded GSU enrollment variation by fully one year.

D. Enrollment Patterns by School

The classical approach of separating enrollment variation into seasonal, trend, and cyclical components can also help identify recent enrollment variation in each school of the university. The table on the following page summarizes the results of such an analysis.

Looking first at the seasonal variation, it is apparent that only the lower division hours of the School of Arts and Sciences and Developmental Studies, and the upper division hours of the School of Urban Life, peak in the fall quarter.

SUMMARY OF
CREDIT HOUR ENROLLMENT VARIATION
1971 - 1976 (22 Quarters)

	Seasonal Index		Growth Trend (Ave. Annual %)	Cycle[1]	
	Low	High		Peak	Trough
Allied Health					
Graduate	.67	1.56(Spring)	*	*	
Upper Div.	.44	1.24(Winter)	41.8	16.6	-13.2
Lower Div.	.22	1.39(Winter)	12.8	35.5	-26.7
Arts & Sciences					
Graduate	.96	1.11(Summer)	0.6	17.6	-12.5
Upper Div.	.73	1.11(Spring	-6.8	10.1	- 7.9
Lower Div.	.58	1.23(Fall)	-0.7	9.6	-11.1
Business Administration					
Graduate	.80	1.09(Winter)	7.1	12.6	- 9.1
Upper Div.	.73	1.10(Winter)	8.1	9.4	-10.3
Lower Div.	.67	1.14(Winter)	3.5	5.2	-16.3
Education					
Graduate	.88	1.35(Summer)	10.8	10.6	-14.9
Upper Div.	.71	1.15(Spring)	-4.2	18.7	-17.3
Lower Div.	.60	1.25(Spring)	-1.5	39.8	-43.3
Urban Life					
Graduate	.70	1.20(Fall)	-13.6	22.7	-28.5
Upper Div.	.65	1.13(Winter)	15.9	18.9	-17.8
Lower Div.	.36	1.45(Spring)	*	*	
Developmental Studies					
Lower Div. (10 qtrs.)	.53	1.32(Fall)	27.8	25.3	-28.6

[1] Maximum percent variation from trend.
*Under 300 credit hours

The large size of Arts and Sciences lower division underlies the fall quarter peak for the university as a whole.

In sharp contrast, the School of Education graduate division and graduate Arts and Sciences face their highest enrollment during the summer quarter each year. The table also shows that the various divisions of each school peak at different quarters, except in the case of the School of Business Administration. There, all three divisions peak each year during the winter quarter. This divergence of seasonal patterns presents each school with a different pattern in its annual staffing requirements.

Looking next at the trend variation from 1971 to 1976 (22 quarters), there is also considerable difference among the patterns of each school. The newer programs of Allied Health, Developmental Studies, and the upper division of Urban Life have shown rapid increases in enrollment. Of the more established schools, only Business Administration has maintained a steady rate of growth in all divisions. Education shows mixed trends, with strong growth in its graduate division, but declining enrollment in its upper and lower divisions. While Arts and Sciences has maintained a steady level of graduate division hours, the upper and lower division enrollment has declined. The upper division has lost enrollment at an average 7 percent annual rate since 1971.

Turning finally to the cyclical variation, credit hours at most schools reflect the same inverse relation to economic activity as do total credit hours. The exceptions are graduate Education, upper division Urban Life, lower division Business Administration, and all divisions of Allied Health. Credit hour enrollment in these divisions appears to increase directly with economic activity.

An important point to notice is the relative magnitudes of the cyclical swings and the trend changes. The amplitude of the cyclical changes range from 10% to -9% in the smallest instance and from 43% to -39% in the largest instance. The absolute annual trend values, on the other hand, range from a low of 0.6% to a high of 27.8%. In every case, the cyclical change is larger than the trend change. This means that for short periods, cyclical changes in enrollment can mask the longer-run trend change.

For instance, the 9.4% upswing in Arts and Sciences lower division enrollment in the winter quarter 1976 that paralleled the slackening in economic activity masked the 0.7% annual decline in long-term growth in this division. Conversely, the 5.5% cyclical downswing in graduate Business hours in the fall quarter 1976 masked the steadily increasing long-term growth.

It should be remembered that no statement can be made about future credit hour enrollment behavior without explicit assumptions that these past patterns will or will not continue. The present study makes no contribution to the dilemma of projecting the long-run growth trends. However, the study does make clear that quarter to quarter variations in enrollment should not be taken as conclusive evidence of growth trend changes. Such changes likely reflect the more predictable seasonal and cyclical variations. (See Appendices B and C for an example of how this conclusion can be useful in a short-run projection model).

IV. SUMMARY AND CONCLUSION

Current and projected enrollment behavior are an essential consideration in planning the university's staffing, space, and budget requirements. This study of quarterly credit hour enrollment at Georgia State University from 1967 to 1976 revealed definite and divergent patterns among the schools that make up the university. Using traditional methods of time series analysis, recurring seasonal and cyclical variations were established so that quarter-to-quarter changes can be anticipated. This study should assist administrators to identify those current enrollment variations that are truly novel. Such variations that break the established pattern may indicate a trend change which warrants administrative action either to adjust to the new trend or to counter the change in trend.

The analysis found that credit hour enrollment for the university as a whole is low each summer quarter, rises sharply to a peak in the fall quarter, and then declines moderately during the winter and spring quarters. Each division of the schools evidences a somewhat divergent pattern, however. Thus each school faces a different pattern in its annual staffing requirements. For instance, graduate credit hours in the School of Education increase substantially during the summer quarter each year rather than during the fall quarter.

Looking at the longer term trend pattern of total GSU enrollment, a period of very rapid expansion drew to a close about 1971. There has followed a period evidencing a relatively lower growth rate. Again, this pattern was not the same for all schools.

During the 1971-76 moderate growth period (22 quarters), the newer programs of Allied Health, Developmental Studies, and the upper division of Urban Life have shown rapid increases in enrollment. Of the more established schools, only Business Administration has maintained a steady rate of growth in all divisions.

Education shows mixed trends with strong growth in its graduate division, but declining enrollment in its upper and lower divisions. While Arts and Sciences has maintained an even level of graduate division hours, its upper and lower division enrollment has declined steadily.

GSU enrollment also has varied with the rises and declines of business activity. In general, enrollment has increased as business activity has declined. Two exceptions have been graduate Education and Allied Health. Here, enrollment has varied directly with the business cycle.

Of great interest, the cyclical swings in enrollment have been larger than the trend variation. This means that short-run cyclical changes in enrollment tend to mask the longer-run growth trend. For instance, the upswing in Arts and Sciences lower division enrollment that accompanied the business cycle decline in the winter quarter, 1976, masked the long-term downward growth trend. Not surprisingly, the negative trend again becomes visible as the business cycle recovers during 1977. It seems reasonable to anticipate that in coming quarters the momentum of further economic recovery will overstate the downward trend in this one division.

While this study makes no contribution to the projection of long-run growth trends, it does establish the pattern of short-run variations. Once these variations are commonly understood and anticipated, discussion of future enrollment variation can overlook quarter to quarter changes and focus instead on the trends within various schools.

Appendix A

TABLE OF SEASONAL, TREND, AND CYCLICAL CHANGES
IN TOTAL CREDIT HOUR ENROLLMENT

(1) Year and Quarter	(2) Total Credit Hours	(3) Seasonal Index (3-yr ave)	(4) Seasonally Adjusted (2)÷(3)	(5) Fitted Trend Value	(6) Deviation from trend (4)-(5)	(7) Percent Deviation (6)÷(5)
1967-68						
Summer	18298	.63	29044	28711*	333	1.1
Fall	50358	1.20	41965	35985	5980	16.6
Winter	51882	1.12	46323	43258	3065	7.0
Spring	56055	1.03	54422	50532	3890	7.6
1968-69						
Summer	39500	.63	62698	57805	4893	8.4
Fall	76602	1.20	63835	65079	-1244	-1.9
Winter	76441	1.11	68866	72352	-4730	-4.8
Spring	75664	1.03	73460	79625	-6165	-7.7
1969-70						
Summer	53691	.68	78957	86899	-7942	-9.1
Fall	103181	1.16	88949	94172	-5223	-5.5
Winter	107371	1.12	95867	101446	-5579	-5.4
Spring	105490	1.03	102417	108719	-6302	-5.7
1970-71						
Summer	80233	.71	113004	115993	-2989	-2.5
Fall	141673	1.13	125374	123266	2108	1.7
Winter	154717	1.11	139385	130540	8845	6.7
Spring	153534	1.04	147629	137813	9816	7.1
1971-72						
Summer	118472	.76	155884	151684**	4200	2.7
Fall	173089	1.11	155936	152788	3148	2.0
Winter	169950	1.10	154500	153893	607	.4
Spring	161806	1.03	157093	154997	2096	1.3
1972-73						
Summer	126252	.79	159813	156101	3712	2.3
Fall	171879	1.10	156254	157205	-951	-.6
Winter	170476	1.07	159323	158309	1014	.6
Spring	162196	1.04	155958	159413	-3455	-2.1
1973-74						
Summer	125166	.81	154526	160517	-5991	-3.7
Fall	170873	1.08	158216	161621	-3405	-2.1
Winter	165117	1.07	154315	162726	-8411	-5.1
Spring	164406	1.05	156577	163830	-7253	-4.4
1974-75						
Summer	133214	.81	164462	164934	-472	-.2
Fall	173955	1.08	161069	166038	-4969	-2.9
Winter	178503	1.07	166825	167142	-317	-.1
Spring	180120	1.05	171543	168246	3297	1.9
1975-76						
Summer	140294	.81	173202	169350	3852	2.2
Fall	196995	1.08	182403	170454	11949	7.0
Winter	196083	1.07	183255	171558	11697	6.8
Spring	184725	1.05	175929	172663	3266	1.8
1976-77						
Summer	129703	.81	160127	173767	-13640	-7.8
Fall	188889	1.08	174897	174871	26	0.0
Winter	188326	1.07	176006	175975	31	0.0
Spring		1.05		177079		

* 1967-1971 linear trend is Y = 21438 + 7273t(std error 5887)
** 1971-1977 linear trend is Y = 150580 + 1104t(std error 6155)

Appendix B

USE OF PATTERNS IN AN EXPLANATORY EQUATION

The classical analysis identified the seasonal, trend, and cyclical components of the quarterly variation in GSU credit hours. There remains an unexplained residual variation consisting of one-time program change and a random error term. To test how well the first three isolated factors account for or "explain" quarterly enrollment variation, they can be used as components of a standard linear regression equation which is then fitted to the actual data. The equation takes the general form:

$$Y = a + B_1(X_1) + B_2(X_2) + B_3(X_3) + e,$$

where Y is total credit hours described as a function of $B_1(X_1)$ a trend factor, $B_2(X_2)$ a seasonal factor, $B_3(X_3)$ a cyclical factor, and e, an error term (all other factors). A "good" explanatory equation is one where calculated B factors, together with the known X values, account for a much larger percent of the variation in the Y values than does the error term.

In the particular GSU equation, the X_3 cyclical variable is the NBER index of leading indicators lagged three quarters, which the classical analysis found has a high correlation with the university's cyclical enrollment pattern. There are actually three seasonal variables X_2. These are categorical variables. If X_2 represents the winter quarter, it takes the value of 1 when the Y credit hour value is for the winter quarter, and 0 for other quarters. All X_2 values are 0 for the fall quarter Y values. The trend variable X_1 is simply the numerical series 1, 2, 3, ..., 22 for the quarters from 1971 to 1976.

The equation solved for the B coefficient values is

Total
Credit Hours = 229569 + 1219 (quarter 1-22) - 1250 (Winter = 1) - 7564 (Spring = 1)
- 49827 (Summer = 1) - 538 (NBER Leading Index) + e

The R^2 value is .970. This means that the equation in this form explains 97 percent of the variation during the 1971-76 period. (Also, d.w. = 2.11, which indicates no serial correlation.)

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Appendix C

USING THE EQUATION FOR SHORT-TERM PROJECTIONS

The regression equation developed in Appendix B does a remarkable job of explaining enrollment variation over the 1971-76 period. Note, however, that the explanation is in terms of the X variables, that is, the actual values of trend, season, and the NBER index.

Consequently, the equation's ability to project future variation depends largely upon the ability to project the underlying (independent) X variables. The seasonal X's are known since the school calendar remains basically the same each year. Also, the NBER leading index is known three quarters before its anticipated effect on enrollment. (Georgia weekly hours worked gives a four quarter lead, but the data is not as universally available.) The trend value, however, is not known for future periods. While the trend path may be intuitively estimated from population trends and other exogenous factors, this estimate becomes a basic assumption for any projection made by such an equation.

For short periods of three or four quarters it seems reasonable to make the simplest assumption-- that the present trend will continue. Given the trend assumption and NBER values three quarters in advance, the equation should do a fair job of projecting enrollment variation several quarters in advance.

As an example, separate equations are estimated for each school and division for the 1971-76 period. NBER and appropriate seasonal values for the winter, spring, and summer quarters 1977 are then used in the equations to obtain the corresponding projections. The school projections are summed to obtain short-run projections for total credit hour enrollment.

The projections assume present patterns will continue. An incorrect projection singles out a division where this assumption bears reexamination.

USE OF EXPLANATORY EQUATION FOR SHORT-TERM
CREDIT HOUR PROJECTIONS

School	Equation (1971-1976)	Percent Explained (R^2)	1977 Projected Values[4] Winter	(Actual)	Spring	Summer
Allied Health						
Upper Div. Hours	= 510 + 60.7(Trend)[1] + 204(Winter)[2] + 188(Spring) - 1321(Summer) + 8.0(NBER)[3]	.939	3112*	(3293)	3167	1731
Lower Div. Hours	= 557 + 38.7(Trend) + 304(Winter) + 33(Spring) - 1476(Summer) + 6.6(NBER)	.953	2578	(2537)	2354	894
Arts & Sciences						
Graduate Hours	= 8237 + 8.7(Trend) + 118(Winter) + 49(Spring) + 1043(Summer) - 4.2(NBER)	.376	8029	(7371)	7964	8960
Upper Div. Hours	= 42542 - 304.1(Trend) + 381(Winter) + 829(Spring) - 8447(Summer) - 118.0(NBER)	.945	21144	(22080)	21146	11388
Lower Div. Hours	= 87429 - 50.2(Trend) - 3719(Winter) - 8977(Spring) - 29382(Summer) - 273.8(NBER)	.974	48248	(53480)	42612	21746
Business Administration						
Graduate Hours	= 23100 + 207.3(Trend) + 444(Winter) - 346(Spring) - 3838(Summer) - 91.7(NBER)	.957	16822	(16488)	16129	12706
Upper Div. Hours	= 22698 + 378.8(Trend) + 66(Winter) - 196(Spring) - 8368(Summer) - 15.9(NBER)	.953	29484	(27662)	29582	21765
Lower Div. Hours	= 7251 + 57.9(Trend) - 34(Winter) - 686(Spring) - 3734(Summer) + 8.8(NBER)	.927	9652	(9720)	9068	6091
Education						
Graduate Hours	= 4827 + 557.3(Trend) + 705(Winter) + 858(Spring) + 12247(Summer) + 97.1(NBER)	.926	30517	(27013)	31343	43436
Upper Div. Hours	= 12511 - 53.4(Trend) + 427(Winter) + 939(Spring) - 2422(Summer) - 27.5(NBER)	.813	8264	(7659)	8689	5234
Lower Div. Hours	= 3954 - 2.4(Trend) - 181(Winter) + 112(Spring) - 710(Summer) - 21.4(NBER)	.666	1037	(1687)	1301	445
Urban Life						
Graduate Hours	= 2045 - 20.8(Trend) + 38(Winter) - 116(Spring) - 407(Summer) - 6.3(NBER)	.889	816	(575)	633	312
Upper Div. Hours	= 1201 + 65.5(Trend) + 194(Winter) + 172(Spring) - 1068(Summer) + 5.7(NBER)	.885	3616	(2681)	3666	2501
Developmental Studies	= 6831 + 178(Trend) - 283(Winter) - 1045(Spring) - 2672(Summer) - 51.3(NBER)	.977	4214	(4211)	3568	2043
		Projected Total Credit Hours	187533	(186457)	181222	139252
		Deans' Budget Projections (OIP 10-12-76)	182901		174729	121119

[1] Serial quarters 1-22 beginning Summer 1971.
[2] Value = 1 for corresponding season, otherwise = 0.
[3] National Bureau of Economic Research's Index of Leading Economic Indicators lagged 3 quarters.
[4] Values for trend periods are 23, 24, 25; and for NBER are 125.3, 126.5, and 128.0.
*Sample calculation, 510 + 60.7(23) + 204(1) + 188(0) + 1321(0) + 8.0(125.3) = 3112.