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A Study on Various Economic Factors Influencing Student Loan Cohort Default Rates

By

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**An honors thesis submitted in partial fulfillment of the requirements for the degree
Bachelor of Science in Business Administration in Finance**

**Sam M. Walton College of Business
University of Arkansas
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Abstract:

In June 2010, student loan debt rose to over \$800 billion, surpassing total credit card debt outstanding for the first time. Along with the increase in the amount borrowed to pay for education, so too, is the percentage of default rates. The analysis presented suggests that cohort default rates increase in number proportionately to annual unemployment rates, while exhibiting an inverse relationship with the average student loan debt upon graduation.

JEL:

H31, H81, H52, A22

Key Word Search:

Student Loans, Student Debt, Cohort Default Rates

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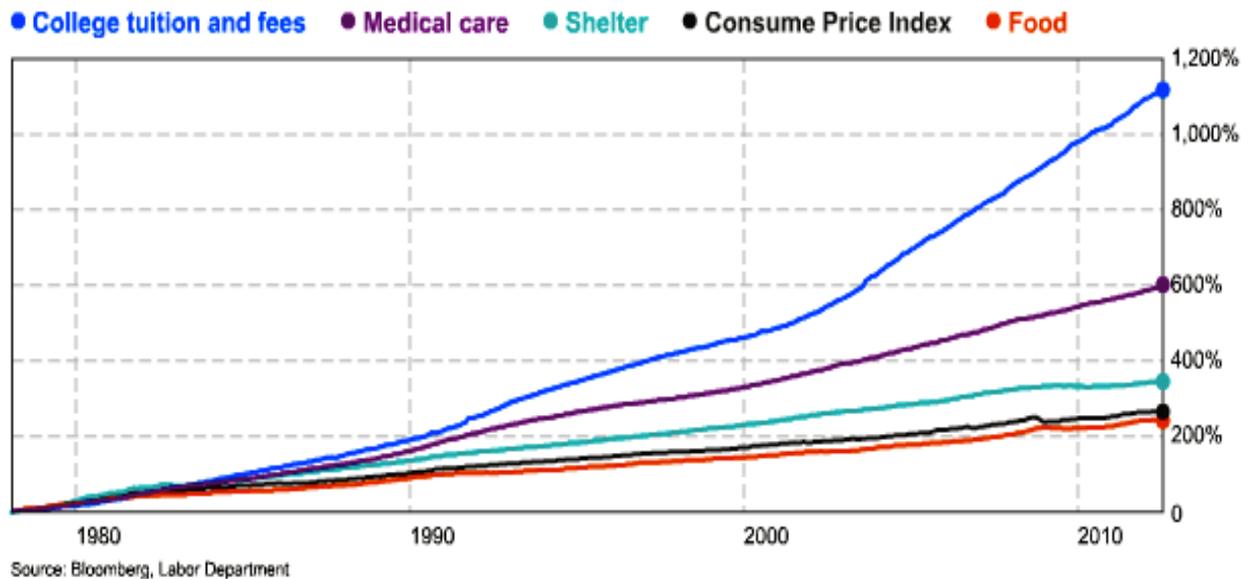
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Section I. Introduction

Education has become one of the largest expenditures of the modern American family, with more young people enrolling in 2-year and 4-year universities than ever before. In fact, many speculate that when the economy is in the midst of a recession, more people opt to either stay in school for a longer period of time in the hopes of riding out a period of high unemployment, or returning to school as a non-traditional student to receive a degree that might improve their job prospects in the near future. In fact, demand for an education is directly driven by the cost of education, which, over the past thirty years, has increased at a rapid pace. According to data based on the Consumer Price Index, the cost of tuition and fees has more than doubled since 2000, outstripping the inflation rate and the growth of energy, housing, and healthcare costs (Moody's, 2011). In fact, as displayed in Chart 1, according to Bloomberg, the cost of pursuing a college education has increased by 1,220% over the past 35 years (Bloomberg, 2012). Chart 1 shows that tuition costs have rose four times faster than the consumer price index and has also outpaced both medical expenses and the price of food. Also, within the last decade alone, balances on student loans grew at double-digit rates. In June 2010, student loan debt rose to over \$800 billion, surpassing total credit card debt outstanding for the first time. According to Moody's Analytics' student on student lending, performance of other consumer loan segments has significantly improved as the economy has recovered, but performance of student loans has remained stagnant (Moody's, 2011). The rise in the balance of student loans is worrisome to current and future students who have no other option than to take out a federal or private loan to pay for education as tuition continues to rise. This paper analyzes five factors within the United States economy to see which have a direct influence on the percentage of total federally funded student loans that default per year.

Chart 1:
Percent change since January 1978



This paper answers the question of “Is the cohort default rate on student loans dependent on common factors within the economy?” Firstly, five factors that were speculated upon as being influential in affecting the average default rate per year were identified. The five independent variables selected were: the average tuition cost in 2010 constant dollars, the average annual income, the number of households in the United States, the average student loan debt upon graduation, and the annual unemployment rate. These variables were used to create a multiple regression analysis to determine the statistical significance of each independent variable.

This paper finds that the economic factors driving cohort default rates are the average annual unemployment rate and the average student loan debt upon graduation. As seen in Table 4, the p-values of both variables are statistically significant at $\alpha = .05$. According to the final model, cohort default rates increase as average annual unemployment rates increase. This is not surprising, as economists have commented in the news about there being a direct correlation between these variables. This model furthers the idea that in times of economic uncertainty with high rates of unemployment, students tend to stay in school for a longer period of time in hopes

of riding out the turmoil of the economy. Of course, the longer one stays in school, the more debt will be taken on to afford tuition and fees. In fact, many scholarships expire after four years of undergraduate studies have been completed, so the amount of federally and privately issued debt taken on by an individual may increase. The model also finds that the average student loan debt upon graduation exhibits an inverse relationship with cohort default loans. While it may seem counterintuitive that as an individual takes on more debt, their expected cohort default rate is lower, it actually makes economic sense. Typically, the most expensive schools are private, well-known universities whose graduates are viewed as being the best and brightest individuals entering the workforce. According to payscale.com's 2011-2012 Graduate Salary Statistics, students graduating from these top universities have a median starting salary upwards of \$50,000 (payscale.com, 2012). Another factor that might play into this trend is that families that can afford to send their child to an Ivy League school or other top-notch university are more likely to be able to help their child pay for college rather than have them take out federally or privately issued student loans to exclusively fund their education. In the final regression model, the independent variable 'average annual income' was not included because of its high correlation with the independent variable 'median federal student loan'. This economic factor cannot be ignored, however, as it is hard to measure. In the preliminary model that regressed all four variables, it was seen that average annual income was statistically significant according to its p-value. As mentioned before, the impact of this variable is difficult to measure in a regression analysis.

This analysis contributes to the working body of knowledge on cohort default rates on student loans in several ways. The regression analysis determines the two main drivers of cohort default loans, average annual unemployment rates and the average student loan amount upon

graduation. By determining these variables, trends in default rates on student loans can be more accurately tracked as the model analyzes the role of other economic factors on cohort default rates by using statistical analysis. The regression analysis also determined that as the economy enters a recession, the cohort default rates could be expected to rise as more students opt to stay in school in the hopes of having more prospects of entering the workforce at a later date.

Section Two is the Literature Review, which is a discussion of the background information and sources used to compose this research paper as well as statistical evidence that supports the validity of formulating a multiple regression analysis to analyze cohort default rates. Section Three is an explanation of the methodology used in the analysis process as well as a discussion of how the independent variable data was gathered. Section Four shows the empirical results of the study while Section Five is a sensitivity analysis to support the multiple regression model results. Section Six is the conclusion to the paper and is followed by references and the figures and tables created for the regression.

Section II.

Literature Review:

In July of 2011, Moody's Analytics published an analysis called "Student Lending's Failing Grade", in which 'the rapid growth of the student loan industry...and what these trends suggest for future performance and lending volumes' were examined (Moody's, 2011). Moody's concluded that even though the student lending industry managed to avoid the brunt of the recent recession, compared to other sectors of the economy, such as other consumer loan segments, the performance of student loans has not seen any signs of improvement. According to the study, dollar balances on student loans grew at double-digit rates throughout the past decade as more people opt to attend college and as tuition and fees continue to skyrocket. Roughly 40% of high school graduates go on to seek some form of higher education, and as the size of this demographic has increased, so to has the demand for a college degree. In addition, the demand for a college degree is driven by the cost of education, which, as mentioned before, has grown significantly over the past three decades. In fact, the research found that the cost of tuition and fees has outstripped inflation rates across all goods. In light of these trends, many families have reexamined the value of an expensive college degree and have begun to explore other options such as attending public universities or community colleges.

Moody's Analytics also found that the demand for education runs counter to the economic cycle. When the economy is in a downturn or in the midst of a recession, many choose to attend college in the hopes that the degree earned will result in better employment opportunities in the long run. This trend has led to an increase in the amount of federally issued student loans individuals taken on because as the economy retracts, so too do state funding to public universities.

It was also found in Moody's Analytics' research that 'the failure of students enrolled at...institutions to complete their degrees is detrimental, as students will have incurred additional debt without significantly improving their employment or income prospects.' This is especially true for students attending for-profit universities and community colleges, which exhibit extremely high default rates. Student loan lending is a risky undertaking to begin with, as the value of a degree is hard to value as it depends largely on the individuals initiative and aptitude.

Several national news providers have also been studying the trends within student lending. An article by the Huffington Post, published February 23, 2012, called "Student Loans: The Next Bubble?" speculated on the possibility of student lending becoming the next economic bubble to burst (Pope, 2011). Several key warning signs that are typical during a bubble were listed within the article, such as how college degrees are in demand. The article stated that because a higher education is traditionally viewed as being a key component of success and the fastest way to get ahead in the workplace, college enrollment has 'surged one-third in a decade'. Like Moody's Analytics, the Huffington Post article explained that as demand for higher education has risen, so too has tuition and fees. Another warning sign stated is that outstanding student loans have rapidly risen and now exceeds credit card debt. Also, listed was the fact that, just like the housing industry, loans are commonly given to applicants when little to no research is made into whether the borrower is able to repay the loan. Also mentioned was that defaults on federal student loans have been on the rise in recent years, which is in concurrence with other articles and research published on the issue. The article goes on to say that while the trend in student lending is significant, the overall effect of a bubble-like situation would be minimal, as roughly 85% of student debt is accounted for by the federal government, which guarantees the loans. The article concludes that even though the trends in student lending look like that of a

bubble, bubbles are only burst when there is a liquidity crisis, with an example being the liquidity crisis of the housing bubble. The author states that ‘even in 2008, in the midst of the financial crisis, when private student loans dried up, the government’s dominant role kept student loans flowing.’ In spite of these facts, the risk to the individual student who has a student loan does not change, as a student loan cannot even be discharged in bankruptcy. In conclusion, this article provided the insight that while student lending may not impact the nation as a whole like the housing bubble did, the effect can be quite substantial to the individual borrower.

Other sources, such as an article written by Bloomberg Businessweek entitled ‘Student Loan Delinquencies Are Worse Than You Think’ and another article by the Chicago Tribune called “ Student Loan Debt a Growing Threat to the Economy’, further echoed the worries and speculations that were studied in Moody’s Analytics publication (Weise, 2012). While each publication hinted at the idea of a new bubble arising from the increasing default rates on federally issued and privately issued student loans, Sallie Mae CEO Albert Lord rejected the claim that education loans will become the next bubble. In a publication by Bloomberg Businessweek, Albert Lord claimed that Sallie Mae has seen no evidence that our economy is even ‘close to a bubble’ (Bloomberg, 2012). He blamed the recent economic recession on the rise in speculation on there being another bubble about to pop on the horizon. Lord claims that people are too quick on the trigger when trying to spot the next crisis.

**Section III.
Methodology:**

Table 1: Variable Names and Definitions

Name	Variable Description (all are monthly values)
Default Rate	Average default rate of student loans per year (in %)
Unemployment Rate	Annual Unemployment Rate (in %)
Tuition Cost	Average tuition, fees, and board cost in 2010 Constant Dollars
Annual Income	Average annual income (in \$)
Student Loan Debt	Average Student Loan Debt (2010 Dollars)
No. of Households	Number of US households

The data collected came from online sources including: the Bureau of Labor Statistics’, Census. Org, the Bureau of Education & Research, and Finaid.org. Seventeen years worth of data was collected for each variable and a regression analysis was chosen to analyze trends and the statistical significance of the independent variables on the dependent variable. The final model indicates that the only independent variables statistically significant are ‘average annual unemployment rates’ and the ‘average student loan amount upon graduation’. The final regression equation (Table 4.) is as follows:

$$Y=27.140+0.855x_1-0.001x_2$$

Where x_1 =average annual unemployment, and x_2 = the average student loan debt upon graduation.

To further test the validity of the regression and quantify the possibility of using the regression to predict cohort default rates one year in advance, the regression was run a second time with a lag of one year. The dependent variable’s time frame was 1993 through 2009, while the independent variables’, unemployment and average student loan debt at graduation time frame was 1994 through 2010. This allows us to test the ability of the regression to predict 2010’s cohort default rate. It was found that the regression as well as the two independent variables remained significant and was able to predicted with 86% certainty the default rate one year in the future. The regression output for the lagged data set are displayed in Table 5. The

Lagged Regression Model equation is as following:

$$Y=22.460+0.630x_1-0.001x_2.$$

Where x_1 = average annual unemployment, and x_2 = the average student loan debt upon graduation.

Section IV.
Empirical Results:

Table 2: Descriptive Statistics of Independent Quantitative Variables¹

	Annual Unemployment Rate	Tuition, Fees, and Board Cost	Annual Income	Average Student Loan Debt	No. of Households
Mean	5.83	17,330.39	39,757.33	20,665.71	103,438,800.7
Median	5.6	16,887	41362	21625	103,245,963
Standard Deviation	1.50	2,551.15	7374.85	3124.85	6,804,060.282
Minimum	4	13,780	28618	14069	93,347,000
Maximum	9.6	21,657	49564	25767	114,825,428
Kurtosis	1.59	-1.30	-1.34	0.06	-1.18
Skewness	1.34	0.25	-0.15	-0.70	0.08

¹ Raw statistics used to create the chart above were obtained from the National Center of Education Statistics in the government publication Digest of Education Statistics: 2011.

Table 3: Correlation between Independent Variables

	Annual Unemployment Rate	Average Tuition, Fees, and Board (2010 Dollars)	Average Annual Income	Average Student Loan Debt	No. of Households
Annual Unemployment Rate	1				
Avg Tuition, Fees, and Board	0.430	1			
Avg Annual Income	.218	.963	1		
Avg Student Loan Debt	0.242	0.897	0.953	1	
No. of Households	0.393	0.996	0.980	0.927	1

Table 4: Final Regression Model

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.942212192
R Square	0.887763814
Adjusted R Square	0.872798989
Standard Error	1.336612899
Observations	18

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P- value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	27.138	2.274	11.932	0.000	22.290	31.985	22.290	31.985
Annual Unemployment Rate	0.855	0.215	3.977	0.001	0.397	1.314	0.397	1.314
Average Student Loan Debt (2010 Dollars)	-0.001	0.000	-10.802	0.000	-0.001	-0.001	-0.001	-0.001

RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted FY 2010 2- Year Official National Student Loan Default Rates</i>	<i>Residuals</i>
1	16.79	1.01
2	14.75	0.25
3	12.96	-1.36
4	11.26	-0.56
5	9.71	0.69
6	8.04	1.56
7	6.45	2.35
8	5.30	1.60
9	6.24	-0.64
10	6.99	-1.09
11	7.23	-1.83
12	7.15	-1.95
13	6.07	-0.97
14	5.34	-0.74
15	4.61	0.49
16	5.50	-0.30
17	6.61	0.09
18	5.59	1.41

Table 5: Lagged Regression Model
SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.941
R Square	0.885
Adjusted R Square	0.869
Standard Error	1.071
Observations	17

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	22.460	2.228	10.083	8.433E-08	17.682	27.237	17.682	27.237
Annual Unemployment Rate	0.637	0.215	2.970	1.014E-02	0.177	1.098	0.177	1.098
Average Student Loan Debt (2010 Dollars)	-0.001	0.000	-9.909	1.046E-07	-0.001	-0.001	-0.001	-0.001

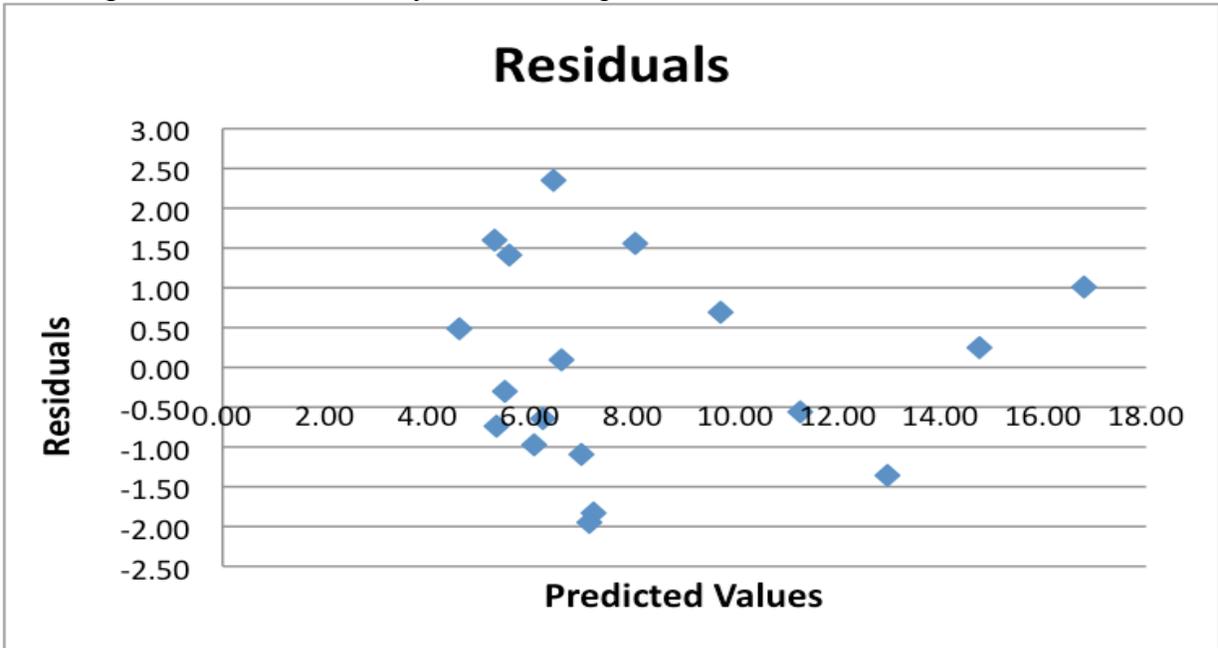
RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>
1	14.1672304	0.833
2	12.599994	-1.000
3	11.2142873	-0.514
4	9.89348616	0.507
5	8.69719912	0.903
6	7.40949679	1.391
7	6.17469896	0.725
8	5.28415117	0.316
9	5.9981441	-0.098
10	6.55032756	-1.150
11	6.72919844	-1.529
12	6.68025364	-1.580
13	5.85257061	-1.253
14	5.2948986	-0.195
15	4.72934546	0.471
16	5.38494534	1.315
17	6.13977227	0.860

This paper finds that the economic factors driving cohort default rates are the average annual unemployment rate and the average student loan debt upon graduation in 2010 constant dollars. As seen in Table 4, the p-values of both variables are statistically significant at $\alpha=.05$. The Annual Unemployment rate variable exhibited a positive relationship with student loan cohort default rates. This indicates that when the economy is in distress, the average student has a harder time paying back student loans because of a contracting job market. The second independent variable in the model, average student loan amount upon graduation, has an inverse relationship with student cohort default rates. This may be due to the fact that higher quality or prestigious schools have more expensive tuition costs than public universities. Students who attend high quality schools will be more likely to find a job soon after graduation, which leads to their loans being paid back in a timely fashion.

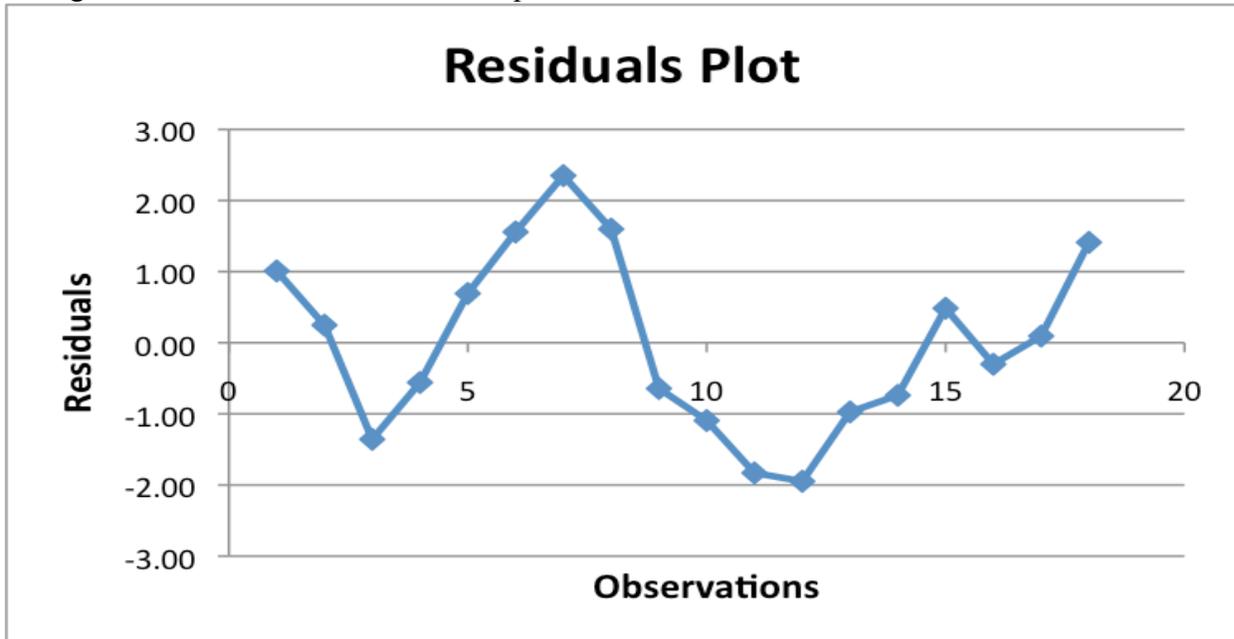
Section V.
Sensitivity Analysis:

Figure 1: Homoscedasticity - Relationship between Residuals and Predicted Values



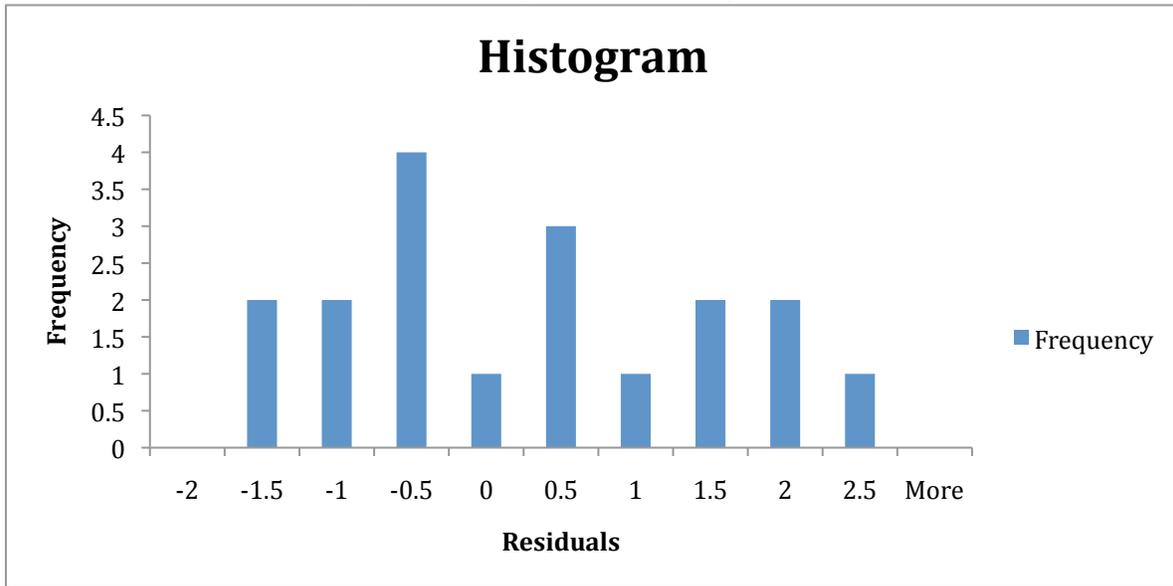
A test for homoscedasticity was run to check for constant variance of the residuals. The residuals exhibit homoscedasticity when there is no pattern within the distribution and have a relatively uniform variance. From Figure 1, it can be concluded that the residuals exhibit slight heteroscedasticity. Although the residuals are not perfectly normally distributed, as seen from the skewness and kurtosis displayed in Figure 1, a normal distribution is assumed because of the lack of a longer time frame.

Figure 2: Residuals Plot- Relationship between Residuals and Time-Ordered Observations



The residuals were also plotted to test the relationship between the residuals and the time ordered observations. The purpose of this test is to see if the residuals are independent of each other. Figure 2 is the residuals plot, by which it can be concluded that the residuals are independent of each other. They do not exhibit a trend or any special pattern. The residuals are distributed randomly between positive and negative values.

Figure 3: Histogram – Bell Shaped Curve



As seen in Figure 3, the model was again analyzed through the use of a histogram to test for a normal distribution of residuals. From the chart, it can be concluded that the residuals are normally distributed with a mean of zero and a concentration of observations around the mean.

Lastly, a robustness test was performed to analyze the correlations of the independent variables. The average tuition, fees, and board cost in 2010 constant dollars was thrown out of the regression because it was not statistically significant and had high correlation with the independent variables ‘average annual income’ and ‘total number of households’. The number of households was also thrown out due to its high correlation with average annual income. The correlations can be observed in Table 3. Average annual income’s adjusted r square was lower than that of the average student loan debt when entering repayment variable, and was therefore thrown out as well.

Section VI.
Conclusion:

This paper finds that the economic factors driving cohort default rates are the average annual unemployment rate and the median student loan debt when entering repayment. . According to the final model, cohort default rates increase as average annual unemployment rates increase. This model furthers the idea that in times of economic uncertainty with high rates of unemployment, students tend to stay in school for a longer period of time in hopes of riding out the turmoil of the economy. The model also finds that as students enter repayment, the students that have the most debt outstanding are less likely to default on their debts, as indicated by the variable entitled ‘Average Student Loan Debt in 2010 Constant Dollars’. This could be due to the fact that the most expensive schools tend to be private universities that are held in high esteem. Students from these universities may have better job prospects coming out of college, and thus a quicker means of repaying their federal loans. The assumptions tested in the regression analysis were further analyzed through the use of a lagged data regression. The lagged data regression analysis further confirmed the validity and impact that both unemployment and the average debt a student has accumulated upon graduation has on the cohort student default rate.

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