

**PA-12**  
**Increasing College Tuition and Its Impacts on  
Student Loans: An Econometric Analysis**

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By:

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**Abstract**

This study utilizes, applies and combines econometric analyses; managerial economics; multivariate statistical approaches; managerial accounting and SAS programming to examine one of the current most heated and discussed topics in the US college history. The relationships among student loans, tuition and colleges spending as well as revenue generated from endowment returns are examined, analyzed, evaluated and scrutinized to answer many unsettled questions on their relationships. The results show that student loans do correlate positively and significantly with college tuition, administrative expenses and money spent on public service activities. Any increases on these expense categories will have positive direct effects on the amount of loans that college students have to take. Investment returns generated from endowment are negatively and significantly related with the loans. Any inefficiency in managing college resources may lead and add college operational cost which only can be balanced by increasing tuition charged to the enrolled students, assuming revenues generated from other sources such as alumni's contributions do not change. Consequently, borrowers have to take more loans to complete their program of studies. Tax payers, currently enrolled students and alumni have no choice but to bail out their respective college from any inefficiency and operational cost increases. Otherwise, the colleges are risked to face both liquidity and solvency problems. Therefore, managing and controlling college spending are vital to reduce college

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tuition. These efforts along with the ability to increase endowment fund and its investment returns are the most important key strategies to cope with the new realities.

## **Introduction**

In the beginning of 2013, there are many articles that have been written in the media about college cost and student loans. The society has asked the real reasons behind such an increasing in the college cost. The American public becomes weary knowing that the total national student loans surpassed \$ 1 trillion mark as reported in various media. The potential default of the loans is imminent, partly due to prolonged weak job market in the US and the phenomenal and fundamental structural changes that have happened in the industry and the US economy. Recent studies showed that there are 7 million student loans borrowers who cannot pay their loans as expected (John Sandman). The structural changes in the job market and in the new economy seem to have changed the situation from bad to worse. After the 2008 housing and financial crises, some of the old skills learned at US colleges are no longer fit and needed in the new economy. Students graduated in certain fields cannot find a proper job simply because the new economy does not need such skills anymore. Consequently, this group of students is taking jobs which do not require a college degree. This means time and money have been wasted. This new reality needs to be considered very seriously by the students or college applicants before making their final decision what to study. At the same time, this new fact needs to be observed by the US colleges of what programs that they need to offer to their clientele. Otherwise,

economic resources and tax payers' money will be wasted even more.

The phenomenal and fundamental structural changes surely will affect the whole infrastructures that have been built for years by the colleges. The relevant question that one might ask is what type of investments is needed and right for the society? Are we going to put more money in the college sport facilities or if building new infrastructures in science, math and engineering is a better choice? Given tremendous changes that are occurring in the industry, the risk of failures on any type of college investments are increasing. For example, do the administrators need to prioritize their spending on building more classrooms or to increase the quality of teaching? In the past the answer to such a question will be both. However, given a decreasing public and private funding, will the decision to go both ways be reasonable? When resources get tighter then prioritizing investment and choices becomes more relevant. US colleges will certainly have to face the same problems that most manufacturing companies in the US have experienced many years ago. The only difference on this current issue facing the US colleges compared to the manufacturing industry is that colleges cannot relocate their operation and classrooms to other locations (countries) as the manufacturing industry has done in the past. Survival choices are somewhat more limited for the colleges. Therefore, the only option for most of them

to survive the phenomenal changes that are taking place is to change their mindsets and to adapt their operational paradigms. Institutional Research Intelligence (IRI) which is an education analytics approach offers such survival tools and way out to cope with the changes.

One simple thing that colleges can do to increase its efficiency is to compare between the money spent and the value it has created. Every single penny paid for good or services need to be linked with the amount of returns generated as the results of that spending. In other words, the time for spending sprees that do not generate more or increase the value of education has come to an end, not just now, but supposed to be many years ago.

Many families, potential students and various groups in the society are seeking for answers on the cause of college cost increases. With so many financial and tax privileges that have been given to the colleges, the tuition should not be increased every year. However, in the real world, it just goes perfectly to the other way around. What factors that have caused the college cost to increase annually? Are there any justifiable reasons for its increases? Most past analyses and studies have mentioned that the college cost rising has surpassed the inflation rate, without further explanations. Therefore, the tax payers are puzzled what will be the real reasons behind it continuous increases? Apparently the tax payers, students and their family are getting tired of supporting the college by constantly taking the student loans or making contributions and paying for something they should not. There are pressing questions which the society has been

waiting for many years ago to find the possible answers to such long and overdue questions.

There are two objectives in writing this paper. The first objective is to help finding answers of the society's questions. The second purpose is to make the colleges aware that they need to change the way to manage their institutions. The college administrators need to understand that the old ways in managing colleges has passed many years ago. With more limited resources that the society has, college decision makers have to change their old operating mindsets. They just cannot simply pass the whole college operational inefficiency or budget deficit to the tax payers, the society or the students to finance them. With the student loans are over \$1 trillion which is higher than the credit card loans, the college administrators have to control their spending by increasing and improving their institution's operational efficiency or if necessary to cut some of the benefits such as health insurance or matching retirement fund or even abandon the faculty members' life-time labor contracts (tenure system). The students who actually have bailed the college out for many years may not be able to keep financing the budget shortages simply because they are having a hard time to find jobs. That is the reason why the recent data show there are 7 million borrowers who are running behind in their loans payment. If each of them, on average has \$10k outstanding loans then there are \$70

billion worth of bad loans<sup>2</sup>. This may not be the issues many years ago when the job markets are stronger to absorb college graduates. But the reality has changed as the time lapses. Therefore, the US colleges have to adapt their policy, operation, management styles, strategies and mindsets as well to cope with these recent dynamic changes in order to survive. Ignoring this fact may potentially lead to many college closures, take-over, mergers or college dilutions. On Thursday, August 22, 2013, the regulator announced that it has made the plan to link college affordability ratings with federal financial aid awards (CNBC).

## **Theoretical Background and the Econometrics Model**

The amount of loans that students will take depends on many factors, but these factors can be grouped into their academic credentials, revenue and cost factors. The last

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<sup>2</sup> This bad loans need to be bailed out. Sadly, the “good” borrowers have to pay for it, and the money does not come directly from the taxpayers’ pockets as it was in 2008 bank bailed out. On July 12, 2013, the regulator announced that they have switched, transferred or shifted the loans servicers to four profit financial institutions and 4 non-profit organizations as reported by Credit.Com on August 14, 2013. There is a good chance that good borrowers’ outstanding loan balances swell after their loans got transferred to the new servicers. Though, one does not know the real reasons of the transferring loans policy to other servicers, it can also be inferred as selling (accounting jargon for it is factoring) the outstanding loans to those mentioned companies. The buyers of the loans will pick the borrowers with good payment history. The regulators will get their money back (perhaps including the bad loans from the buyers), and use the in-flow cash for the next

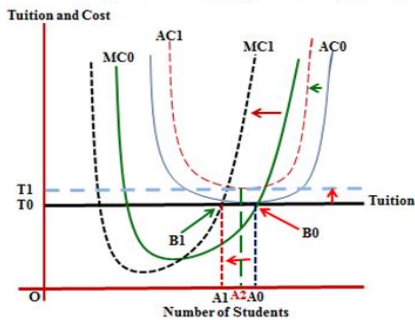
two factors will be the focus of this study. Theoretically, one can explain and analyze such an increase in the college cost using economic theories combined with comparative equilibrium analyses. In this paper, it is assumed that the education industry meets all the requirements for perfect competition (PC) market structure assumptions as discussed in the standard economics theory. However, this market structure may not be true in the real life. For example, products or education services offered by each college are not homogeneous, even though the name of the courses is the same. Chemistry 101 taught at the University of Chicago (UC) may not be the same as that of the University of Nowhere’s. For the UC offers different levels of Chem 101, though the name is the same. The perfect competition assumption can be justified because the education industry has

cycle in the loans business. The new owners of the loans will pass any “transaction cost” plus “profit margin” plus the bad loans (if they are included in the agreed purchase price) to the borrowers. Another possible horrifying story is that when the loan got transferred from Department of Education to the new servicer entities; either profit, semi-profit or not-profit organizations then the total original borrowed amount and not the last and current loan balance was transferred. This means, payments that have been done prior to that will not showed up on the borrowers’ account with the new loan servicer institutions. Therefore, the borrowers have to pay twice to different entities from the same originated loans. Therefore, the “new loans” that the “good” borrowers have to pay may increase tremendously. New owners of the loans and the regulator are the apparent winners of this transaction, and the students are the clear losers, which is a tragic and unfortunate.

been around for years, and therefore may meet the long-run condition assumption<sup>3</sup>.

As shown in Figure 1, before any tuition increases, a particular college operates at point  $B_0$  where the tuition curve/ horizontal line ( $T_0$ ) touches the average cost ( $AC_0$ ) at its lowest or minimum point and the number of enrolled students at that point equal to  $OA_0$ .

Figure 1 - College Cost and Tuition



Operating at point  $B_0$  (the ideal point/IP) signifies four important points: (1). The college is operating at its most efficient and lowest cost and at the same time (2). Fulfill its legal status as a non-profit (breakeven) organization and therefore exempt from paying tax; and (3). Delivering best possible education values to their customers such that students' and their family members' utility function (satisfaction) are max out and (4). All resources are employed efficiently. Needless to say that currently, not too many US colleges if none at all even know where (at what point) they are operating at this moment. As results the colleges are managed without any accurate and not even with enough strategic information. Surprisingly, almost all college administrators have only one common goal, and that is to increase student enrollment

(exception to top-tier schools). The most recent example of this unfortunate decision occurred in Virginia. The state university has made a decision to reduce the financial support and grants to the lower income students. Two reasons were cited. (1). The institution has increased its enrollment and (2). The support program runs through AccessUVa is too expensive.

([http://www.businessweek.com/articles/2013-08-08/uva-tells-low-income-students-to-borrow-for-school?campaign\\_id=yhoo](http://www.businessweek.com/articles/2013-08-08/uva-tells-low-income-students-to-borrow-for-school?campaign_id=yhoo)). Using Figure 1 above, one might agree with the school administrators in Virginia if they are operating at any point prior reaching point  $B_0$  where increase in enrollment will lower the average cost ( $AC_0$ ). However, beyond that point, any attempt to increase student enrollment will results on higher average operational cost. This analysis is confirmed in the real world as shown what has happened in the state of Virginia. When the pool of money is not enough for everyone, then the buyers for the education have to pay more education cost from their own pocket. The school's administrators can avoid such decisions if they keep the enrollment at IP (ideal point), and award the financial aids based on the probability of success from each applicant. This IRI tool (how to calculate the probability of failure) has been written and presented by the authors at 2012 SCSUG meeting in Houston, TX and at 2013 MWSUG meeting in Columbus, OH.

When the US economy experiences a significant structural change in more recent

<sup>3</sup> All information is assumed to be revealed in the long-run which leads institution to operate at a break-even point.

years, it also affects the college operating cost. For example, increase insurance premiums, utilities and classrooms maintenance cost or teaching, staff and administrators' salaries and other fringe benefits have pushed the operational cost up. Increasing operational cost is shown by the shift of the average cost up from  $AC_0$  to  $AC_1$  and the marginal cost moves from  $MC_0$  to  $MC_1$ . Under the new condition, the college cannot operate at its original ideal point (IP) anymore. When the IP changes, the institution no longer can enroll  $OA_0$  number of students, unless it is able to raise enough alumni contributions<sup>4</sup> and endowment fund where its return can be used to offset the additional operating cost. But the AC will not drop back from  $AC_1$  to  $AC_0$ . This means the institution has to operate at a higher operational cost to provide the same level of services to the same enrolled student ( $OA_0$ ). This is one of the obvious reasons why alumni always get invited to attend annual fund drive. While all fund raising efforts are expensive, time-consuming, require a hardwork and inconvenience, then the colleges have no choice, but turn to their currently enrolled students to fill the budget gap if not enough money is generated. Successful fund-raising campaigns may lead the college to keep their tuition at  $T_0$ . However, chances are pretty good that the administrators who are operating under the dark (with no strategic information) will charge the tuition at  $T_1$  so long the school Board stamps it.

## Data and SAS Codes

This paper examines the relationships among the college cost, tuition and student loans by applying econometric approaches. Spending supposed to be the main drivers in college cost increases over many years in the past and therefore may explain the reasons behind the student loans increase. This is the maintained hypothesis which this study tries to answer. Knowing such relationships will shed the light and give directions to the decision makers of what needs to be done to keep the college cost reasonable, competitive and therefore lower the amount of loans that students have to take.

In addition to the four cost categories as listed below which serve as the independent variables in the equation, this study also considers other variables which may lower the tuition such as revenue generated from endowment investment or alumni contributions. This paper looks closely on public and not-for-profit institutions and their undergraduate programs.

NCES/IPEDS has classified college cost into four categories. These four categories make up a 100 percent of college total spending. These four-group of cost are `admin_share`, `research_share`, `instruction_share`, and `pubserv_share` variables. Following the NCES/IPEDS definition, these four variables show the facts where the revenue generated from tuition and other sources is spent. The definitions of these variables are:

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<sup>4</sup>The Alumni Office is pretty active in contacting its members for their contributions.

1. Admin\_share: Academic and institutional support and operations and maintenance share of education and related expenses.
2. Instruction\_share: Instruction share of education and related expenses.
3. Pubserv\_share: Public service-related share of expenses.
4. Research\_share: Research-related share of expenses.

The data set contains all US public and not-for-profit colleges and universities along with other education organizations. Some of the early year's shares data are missing. Therefore, some schools may have more data/observations than others. If the data are not available, then the schools will be deleted from this study. We are not trying to fill the missing observations using the most common technique. Therefore, whatever we got from the data source, it will be presented in the analyses. This approach will certainly help avoiding any unnecessary discussions regarding the accuracy of the data and it permits one to focus on the important issues and try to find the answer which may help fixing the broken wheels.

The following three variables are added in the analyses:

1. loan\_avg\_amount: Average amount of student loans received by full-time first-time degree/certificate-seeking undergraduates.
2. tuitionfee02\_tf: In-state tuition and fees for full-time undergraduates (Sticker price).
3. eandg01\_sum: Total education and general expenditures, current year total (adjusted).

The loan\_avg\_amount is the dependent variable in the equation while the tuitionfee02\_tf will be added in the right hand side of the equation. Total education and general expenses are shown by variable eandg01\_sum. To eliminate the inflation effects which may possibly skew the analyses, this study has transformed all these cost variables in the 2010 constant dollar as presented by hepi\_scalar\_2010 variable. The following SAS codes are used to produce the results:

```
DATA FAC; SET LOV.ALLOUT2_OUT;
If admin_share='.' Then Delete;
If instruction_share='.' Then Delete;
If pubserv_share='.' Then Delete;
If research_share='.' Then Delete;
Rtuition=(tuitionfee02_tf)/(hepi_scalar_2010);
TEDGEN=(eandg01_sum)/hepi_scalar_2010;
EFFIC1=(admin_share*TEDGEN);
EFFIC2=(instruction_share*TEDGEN);
EFFIC3=(research_share*TEDGEN);
EFFIC4=(pubserv_share*TEDGEN);
L1RLOANS=LAG(RLOANS);
RLOANS=(loan_avg_amount)/(hepi_scalar_2010);
RUN;
```

```
PROC REG DATA=FAC;
MODEL RLOANS= L1RLOANS RTUITION
L1RINVEST EFFIC1 EFFIC2 EFFIC3
EFFIC4/COLLIN DW DWPROB;
RUN;
```

The collinearity and autocorrelation problems on regression residuals are checked using the COLLIN and DW in the PROC REG option. Without the lagged dependent (L1RLOANS) variable, the above model suffers autocorrelation problem. Therefore, this variable is added into the right-hand-side of the equation. The results of econometric estimation and other regression output are presented in Appendix-1.

## Results

The estimation output shows that student loans are positively and significantly related with its lagged variable; college tuition; and money spent on administrative and public services. Positive correlation means, the higher the spending on these expense groups, the more loans that the students have to take. On the other hand, the student loans have a negative relationship with returns from investment. Other spending on research and teaching have no significant impact on student loans. We have long hypothesized that the interest rates with all the hypes on student loans that the Law Makers are trying to do will not cure the real problems for they may not be the right prescriptions. It just tries to treat the symptoms and not the real disease or illness. On the other hand, this study statistically shows that managing and controlling college operating cost will bring the cost of education down significantly, and therefore may ease the student loan problems.

solving the issues. However, as time passes by, the problem will be more complex and may get worse. US colleges need to help avoiding this potential tragedy from occurring by lowering their operational cost.

## **Concluding Comments**

The current student loans problems may not be solved sooner as many people, students and their family members, as well as the society are hoping for. At present, there are no (long-run) policies geared toward



### Appendix 1- Regression Results on Student Loans and College Cost

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	5843036715	834719531	420.23	<.0001
Error	4274	8489550013	1986324		
Corrected Total	4281	14332586728			

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	1	2020.27141	66.87905	30.21	<.0001
L1RLOANS	1	0.52361	0.01259	41.59	<.0001
Rtuition	1	0.03764	0.00218	17.30	<.0001
RINVEST	1	-5.91853E-7	1.118555E-7	-5.29	<.0001
EFFIC1	1	0.00000107	4.172359E-7	2.56	0.0104
EFFIC2	1	-3.55467E-7	2.296351E-7	-1.55	0.1217
EFFIC3	1	-1.34582E-8	3.292702E-7	-0.04	0.9674
EFFIC4	1	9.009399E-7	5.267979E-7	1.71	0.0873

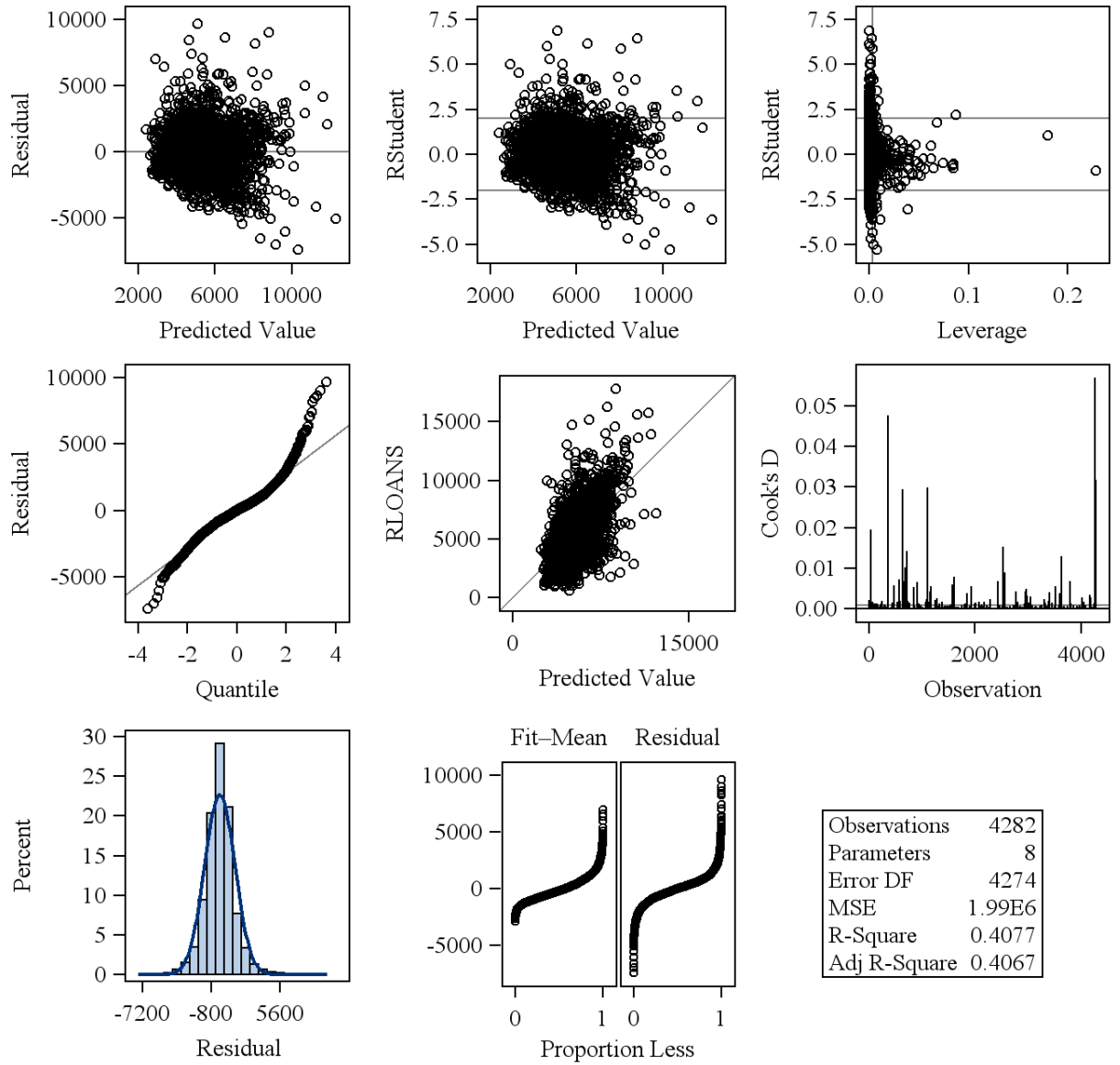
Collinearity Diagnostics										
Number	Eigenvalue	Condition Index	Proportion of Variation							
			Intercept	L1RLOANS	Rtuition	RINVEST	EFFIC1	EFFIC2	EFFIC3	EFFIC4
1	4.53770	1.00000	0.00291	0.00259	0.00797	0.00377	0.00452	0.00239	0.00395	0.01068
2	1.66950	1.64864	0.01254	0.01262	0.04932	0.00979	0.00285	0.00335	0.00870	0.01981
3	0.93815	2.19929	0.00017182	0.00006718	0.00507	0.90267	0.00049425	0.00031380	0.00012667	0.01953
4	0.38879	3.41633	0.01020	0.00546	0.09164	0.07379	0.01870	0.00453	0.03854	0.61010
5	0.27050	4.09574	0.06247	0.03082	0.80569	0.00650	0.00785	0.00064323	0.00256	0.21321
6	0.09870	6.78061	0.00268	0.01474	0.00011245	0.00290	0.62229	0.00004671	0.51330	0.00191

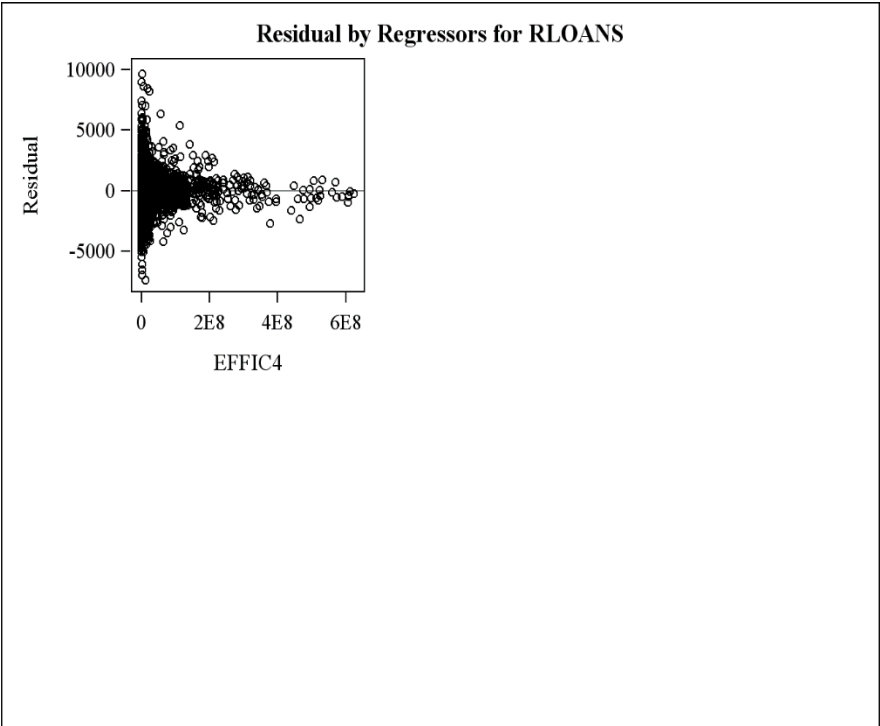
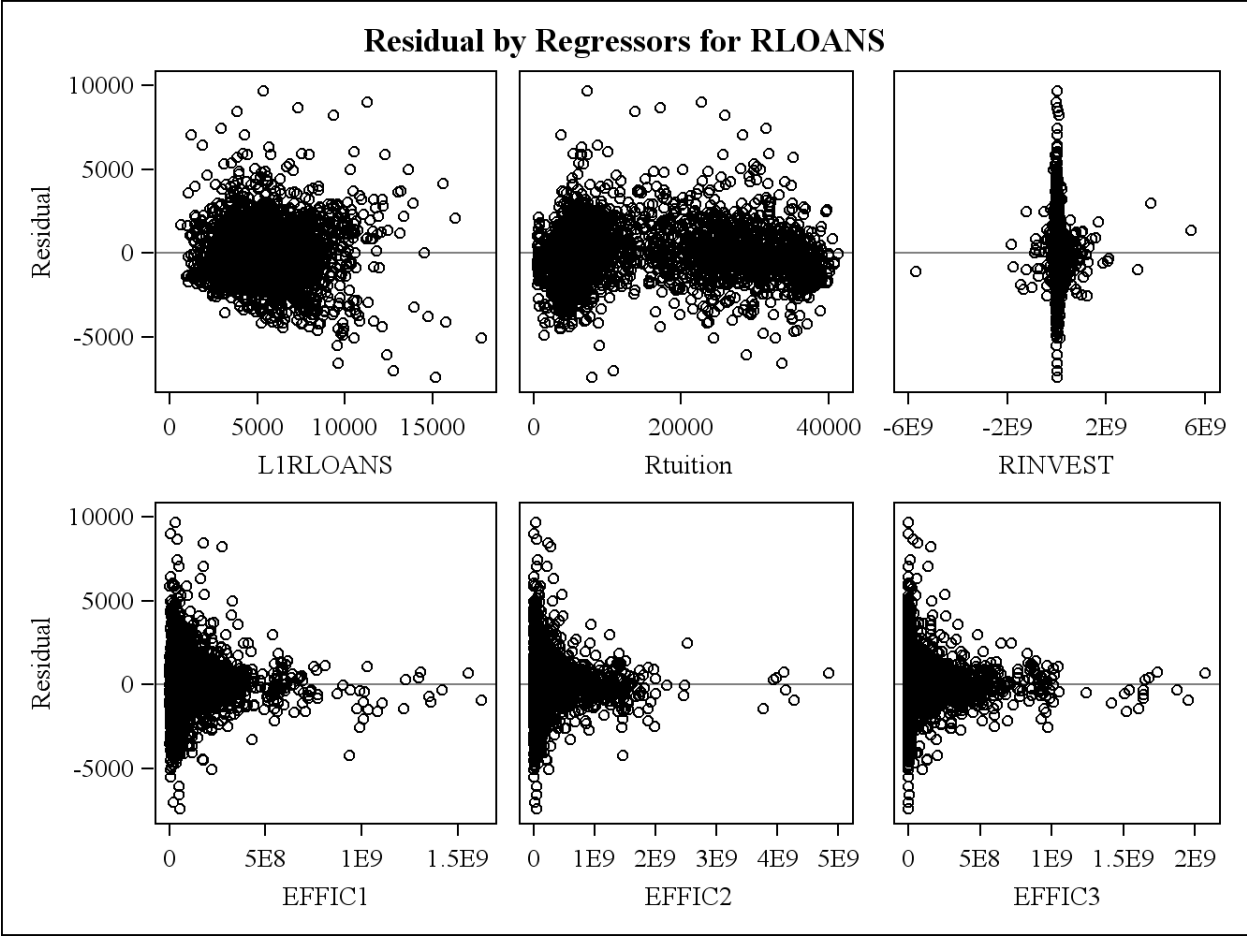
**Collinearity Diagnostics**

Number	Eigenvalue	Condition Index	Proportion of Variation							
			Intercept	L1RLOANS	Rtuition	RINVEST	EFFIC1	EFFIC2	EFFIC3	EFFIC4
<b>7</b>	0.05380	9.18394	0.85235	0.87746	0.03961	0.00030074	0.03300	0.03695	0.00688	0.00613
<b>8</b>	0.04287	10.28814	0.05668	0.05625	0.00059080	0.00028094	0.31030	0.95177	0.42594	0.11864

<b>Durbin-Watson D</b>	1.939
<b>Pr &lt; DW</b>	0.0199
<b>Pr &gt; DW</b>	0.9801
<b>Number of Observations</b>	4282
<b>1st Order Autocorrelation</b>	0.030

### Fit Diagnostics for RLOANS





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