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The Effects of Change in Exchange Rate and Number of Students Visited on the Change in Number of International Students' Applications Received.

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Abstract

This analysis empirically tests the relationship between change in number of applications received operationalized theoretically through change in number of students visited internationally and change in exchange rate for each respective country in my dataset. According to this study's primary model, every increase of nominal exchange rate from 2014 to 2018 resulted in an increase in change in number of applications of 0.00246 applications, ceteris paribus. Similarly, every increase of number of students visited between 2014 and 2018 was followed by an increase in change in number of applications by 0.0664, ceteris paribus. Hypothesis testing indicates that the slope coefficient of exchange rate is not statistically significant, while the slope coefficient of change in number of students visited is statistically significant. Surprisingly, however, the regression also indicates that there is a positive relationship between change in exchange rate and change in number of applications received.

[1] Many Thanks to Dr. Mark Foley for guiding me through this project through trying times. Any errors are mine alone.

I. Introduction

The United States has historically been the top destination for international students owing to its quality higher education system, welcoming culture, and relatively open labor market. Today, the United States remains the country of choice for the largest number of international students, hosting about 1.1 million of the 4.6 million enrolled worldwide in 2018. These students are spending a good amount of money to study in the united states. Especially, if one dollar costs a lot of the home country's currency, then multiply that number by that denomination. Table1 shows Davidson College's top 10 countries that have to pay a considerable amount of money because of the volatile nature of exchange rate. Consider Vietnam for instance, a student from Vietnam has to pay 33464.63% more.

Country	Exchange Rate 2014	Exchange Rate 2018	Exchange Rate Δ	% Change
Vietnam	6.2962	23290	2107	33464.63%
Argentina	8.278	29.7509	21.4729	259.40%
Syria	151.2	514.98	363.78	240.60%
Turkey	2.1672	5.9832	3.816	176.08%
Egypt	7.1502	17.895	10.7448	150.27%
Nigeria	162.1309	360.8682	198.7373	122.58%
Ukraine	13.0954	27.4616	14.3662	109.70%
Kazakhstan	181.9337	361.803	179.8693	98.87%
Tajikistan	4.99	9.42	4.43	88.78%
Russia	36.1223	67.3317	31.2094	86.40%

Table 1. Top 10 countries' percentage change in exchange rate from Davidson College international students between the year 2014 and 2018.

This begs the question; how the volatile nature of exchange rate affects the number of applications received each year. Furthermore, colleges are interested if they should set aside some amount of money in case a country like Vietnam experiences a big jump when compared to the year a student from a country was accepted. If exchange rate is a big factor in deciding to study in the united states, then colleges should set aside some amount of fund to help those students who are affected by fluctuation of their home country currency. To assess this, a simple regression will be run with the change in number of applications received

from 2014 to 2018 with change in exchange rate and change in number of student's colleges visit in international college fairs as the explanatory independent variables.

Section II contains an overview of the literature regarding exchange rate and its effect on number of applications colleges receive. Section III develops the mentioned regression model of the study, creating multivariate regression to test the change in exchange rate and number of students visited on change in number of applications received from 2014-2018. Section IV describes this study's data source and provides summary statistics. Section V contains an analysis of the regression tests and discusses their results, their significance, and the tests' qualities. Section VI gives concluding remarks and discusses possible implications for past and future studies.

II. Literature Review

In general, there is little literature addressing the topic of international studies with regard to exchange rate, while in related studies results have yield ambiguous predictions about the effect that exchange rate may have on international student studies. Among those studies, Abbott and Ali (2009) intended to relate to several factors such as change in GDP, per Capita GDP, exchange rate, income categorized by fifty countries within the time frame of fifteen years from year 2000 to year 2014. Another related study, Liu and Wang (2009) further extended the model used in Naidoo (2007). This particular study looked for major determinants behind international student mobility by creating a framework that captures economic and non-economic factors.

Abbott and Ali examined the impact of exchange rate fluctuation and university reputation on the choice of study destination of international students. They used data from several students studying in universities in Australia and New Zealand. The Authors developed their estimation using annual change in number of international students as a dependent variable, and changes in exchange rate, growth of per capita real GDP in the country of origin as independent variables. On another model, the authors also used dummy variable the degree to which international students are accommodated in offshore campuses. The authors

then developed a regression analysis to examine how significant exchange rate variation and real GDP per capita variation are on the variation of number of international students in those universities. Their findings show that exchange rate does have an influence on the decision to study in a given country. According to the authors, this result is not uniform across all country of origin. This result is also mirrored in their findings with GDP per capita: exchange rate variation appears to have a smaller impact on those students from countries which are economically poor, but a larger impact on students from countries which are economically rich.

The distinction that this study makes regarding impact on developed and developing countries is important. International students who are from countries that are economically rich usually pay for tuitions, therefore it would make sense for those countries that their decision to study in given country is affected by variations in exchange rate. Similarly, international students who are from countries which are economically poor usually get financial aids, and since those students do not pay as much money as the students who pay full tuition, their decision to attend a college or university is less affected by fluctuations of exchange rate.

Another related study is from Liu and Wang (2009) who extended the research model in Naidoo (2007). In this study, the authors looked for factors that can affect international student mobility. They categorized factors such as size of young generation population, level of global involvement, distance between host and source countries that signifies cultural proximity, and political factors of whether a country supports higher education as non-economic factors. As an economic factor, they used variables such as tuition in country where the student is studying and purchasing power parity between the two countries. As a result, they found that relative living expense has a negative impact on enrollment but ambiguous coefficient sign for effect to exchange rate on international student enrollment. They note that the effect of PPP, that also takes in the consideration of living expense and exchange rate, has little to no effect on international student mobility for their model.

On the other hand, the relationship between exchange rate volatility and international trade has been extensively studied in the literature but there is no unanimity about their relationship. There are conflicting arguments in previous studies about the relationship of exchange rate volatility with international trade. Past studies can be divided into three categories with regards to their findings: studies that report positive relationships, studies that negative relationships, and studies that report varied results. For instance, Cheong et al. (2005) investigated the dynamic interrelationship between trading volume, price competitiveness, and exchange rate uncertainty by focusing on the manufacturing industry of the U.K. and found that exchange rate volatility positively affects export trade and ultimately affected the economic performance of the country. A case that showed negative relation, Serenis and Tsounis (2013) examined the effect of exchange rate volatility by considering two countries, Croatia and Cyprus, as a sample on sectoral exports for the period of 1990 to 2012. They revealed that exchange rate volatility negatively affected export volume. Notice, however, none of these studies used number of student colleges visited, in my study that variable will be included as explanatory variable to run the regression model.

III. Model Development

This study theorizes that change in exchange rate and number of students visited from a particular country have a significant effect on number of international students who apply to Davidson College. Given the insights of past studies and how their findings direct continuing research, I have developed the following econometric model intended to isolate the effects change in number of students visited and exchange rate may have on number of international students enrolled from a particular country.

$$\Delta \text{ in number of students who applied}_{\text{country}} = \beta_0 + \beta_{1\ \Delta \text{ in exchange rate relative US currency}} X_{1\ \text{country}} + \beta_{2\ \Delta \text{ in number of students visited}} X_{2\ \text{country}} + \beta_{3\ \Delta \text{ in GDP per capita income}} X_{3\ \text{country}} + \beta_{4\ \Delta \text{ in inflation rate}} X_{4\ \text{country}} + \ldots\ldots \beta_{8\ \Delta \text{ Education Index}} X_{8\ \text{country}}$$

Where β_0 represents the constant of the equation, and β represents the coefficients of correlation

In that model, the dependent variable is the change in a number of students who applied from a particular country to Davidson College between the year 2014 and 2018. The date 2014 is chosen because

the college did not keep a proper record prior to 2014, and the year 2018 is chosen because this study is done in 2019 and the academic year has not ended so the number of applications received this year is not fully recorded.

This model includes five control variables that, if not included, may skew the results of the regression. First of these control variables is the difference between a country's GDP per capita income between the year 2014 and 2018. Past literature has shown that GDP per capita and education are related. The richer a country becomes, the more educated the country becomes. Thus, I expect a country's changing GDP per capita to be positively correlated with the number of international students who apply to College, since better education is related to the amount of money one is willing to expend on education.

The second control variable is change in inflation rate of the country from the year 2014 to 2018. This is important because income is not the only factor that affects education. Willingness to spend is also affected by how expensive the goods and services are in a given country since it can also counter the increase or decrease of income. I would expect this variable to be negatively correlated since the more change in inflation rate affects income, which also affects number of students who apply to a given college.

The third control variable is the change Education index of the country from the year 2014 to 2018. A country that has an education index close to 1 has better literacy rate and better education system. The United States has an education index around 0.900, which is why many students from all over the world want to attend a college in the United States. The more the country is literate and educated, the more it attracts students that are from a country that has a lower education index. From this hypothesis, I would expect change in education index to be negatively correlated to number of students who apply to the united states. This is because the more there is a positive change in education index of a country, the more it attracts other countries that have lower education index relative to that country, thus students would be less incentivized to apply to foreign countries if their country has a good education system or higher education index.

The fourth control variable is the change in Global involvement of the country. Globalization is a main tendency for world economic development and business in a global system that has become more and more integrated. The more involved a country is in a global economy, the more human capital resource wanted who are able to handle the challenges of the global system. So, countries are more likely to encourage students to study abroad, and students themselves also want to become more competitive in the global economy; overseas study becomes a must for a given countries' future workforce. This involvement in the global economy is measured as foreign direct investment in the country, because higher foreign direct investment shows that a given country has more connection with outside world, its involvement level is higher. I expect change in global involvement of the country to be positively correlated to international student enrolment. As the country is more globally involved, the more it wants a workforce that is globally involved, and in addition students are willing to become more globally competitive.

The final control variable is the change in the size of the young generation population of the country. The larger population of younger generation, the larger people need to be educated and larger number of students choose to study abroad. I expect change in the size of the young generation population of the country to be positively correlated with the number of international students' enrollment.

This study's two explanatory variable of interest are change in exchange rate and change in number of students visited between the years 2014 and 2019. For change in number of students visited from a country, I expect the nature of relationship with change in number of international students to be non-linear. Schools might be more responsive to the initial levels of visit since it is the symbolic act of giving an opportunity for students to further their studies. Furthermore, initial visit also shows the school and the country as a whole the whole that it is possible to get better education internationally that may not be available in-home country. As number of students visited increases through the years, students become more aware of other destinations besides the united states and will have more options in choosing opportunities, and so the number of students who apply will diminish when compared to the initial visit.. However, linearity is assumed in Model one since, to my knowledge, this variable has not been used in past

literature to determine the effect it has on number of international students who apply, and assuming non-linearity is a farfetched assumption without even knowing there is any effect at all.

As for change in exchange rate between the year 2014 and 2018, I expect it to share a non-linear relationship with the change in number of international students who apply to college. As nominal exchange rate increases, it takes a whole lot of home currency to pay tuitions in US. Dollar, and it affects the willingness to pay a significant amount of money for tuition. The number of students who apply at the initial year will decline as nominal exchange rate increases and tuitions cost a lot more than they do before.. However, linearity is assumed in my Model since theory does not specify the nature of the relationship between change in exchange rate and number of international students who apply.

IV. Data Discussion

This study uses dataset that is collected by Davidson College international student's admissions office, and a dataset that was taken from the website that compiles official exchange rate that was reported by IMF and World Bank. These dataset start from 2014, and the reason I had to use 2014 was because Davidson College international admissions office did not have proper records before 2014, and since I wanted to go as far back as we can to capture the effect 2014 was the best I can get. In the dataset from the international admissions office, 112 countries are recorded to have applied to Davidson College from the year 2014 till 2018. But that dataset also includes number of students who the admission office visited in their home country, and similar years are used to keep the data consistent with the other data time series. The change in number of international students from 2014 to 2018 is this study's primary dependent variable, while the number of students the admission student's office visited internationally is one of the explanatory variables in my study.

For change in exchange rate of the country from 2014 t0 2018, I used the data reported by a UK based website[2] that gathers the historical exchange rate data from IMF and World Bank. For my analysis, I

[2] https://www.exchangerates.org.uk

used historical currency from August 2014 till August 2018, since the month August is the month that most international students are accepted and decisions to apply are made once the incoming class has been accepted.

Several things to note about these data is that the exchange rate is the nominal exchange rate of one dollar converted to the respective countries' foreign exchange rate. Although real exchange rate is more realistic and probably more useful for this analysis since the nominal exchange rate only tells how much foreign currency can be exchanged for a unit of domestic currency, versus the real exchange rate tells how much the goods and services in the domestic country can be exchanged for the goods and services in a foreign country, real exchange historical data are hard to come by and takes a lot of resources and time to gather those data. Furthermore, since we are looking for foreign exchange rate data that can be used to determine the effect it may have on decisions of enrolling in a college or not, expected foreign exchange rate may have been more suited for this analysis. Expected foreign exchange rate tells us how much the country thinks its own currency will appreciate or depreciate given the economic conditions of the country, versus a nominal exchange rate that is reported at a specific date. But it is hard to get data on expected foreign exchange since it included the fears and other qualitative human behavior to decide how much that currency would be at a specific date. For that reason, I have chosen to use nominal exchange rate.

The dataset I used does not include the countries Zimbabwe, Venezuela, and Belarus. The reason why these countries are not included is country specific. Zimbabwe have had an inflation that forced the government in 2015/16 to allow other currencies to be used in the country as legal tender. Finding Zimbabwe's inflated currency and other currency used in that country does not really give a concert number that can represent the data properly. Similarly, Venezuela has had an inflation rate that made their currency worthless and not to be used to buy a good or service in the country, in fact people in Venezuela, among other means, chiefly use barter to buys goods and services. Belarus, on the other hand, changed their currency multiple times throughout 2014 and 2018, and so it is very hard to gauge the exact exchange rate at a specific time.

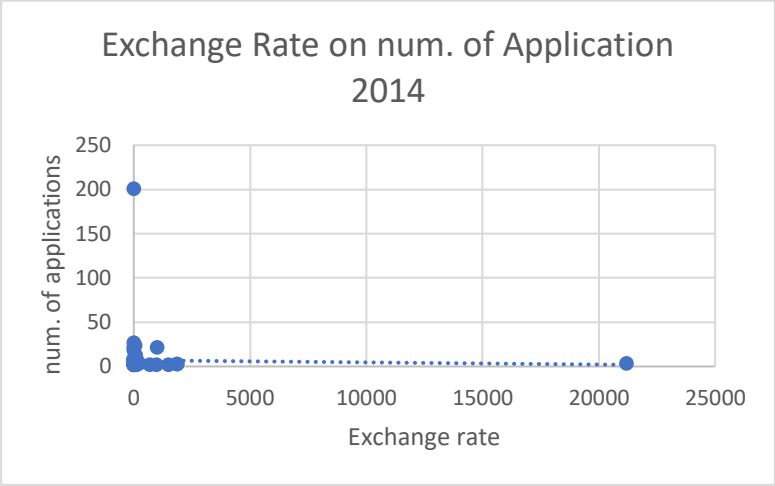
My data does not need "cleaning" because after reviewing my dataset, I did not find any incomplete or incorrect parts of the data. Getting the data right from the internet and the international students admissions office gives us the exchange rate, number of students who applied, number of students visited at a specific year and date. This data, on the other hand, includes outlier such as Belarus and Venezuela since they had a issues with their currencies from August 2014 to 2018. Those numbers are inflated, and they do seem to appear as outliers on descriptive statistics presented on Table 2. The maximum exchange rate in 2014 appears to be 21182.4009 Belarusian ruble for 1 US. Dollar, as I have mentioned before that number is incorrect due to economic conditions of Belarus at that time. In 2018, the maximum exchange rate is 141576.9124 Venezuelan bolívar for 1 US. Dollar. Similarly, that number is due to inflation of the economy in Venezuela. Having those numbers in the data will skew the mean, range, and other descriptive statistics that may be misleading.

In addition, since this study is trying to gauge the change from one year to one, it's important to have the data be in change from 2014 to 2018. By doing that, we not only measure the change, but also remove fixed effects that may not have changed from the year 2014 to 2018.

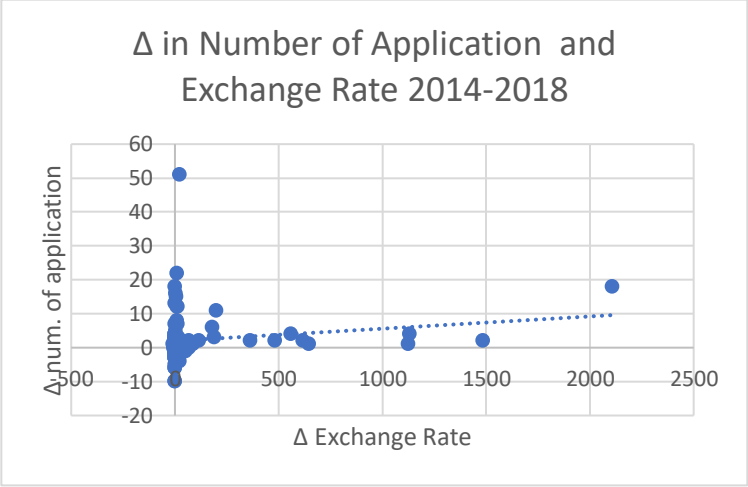
Year	**2014**			**2018**		
Variable of Interest	*num. of Application*	*Exchange Rate*	*num. of Students visited*	*num. of Application*	*Exchange Rate*	*num. of Students visited*
Mean	6.918918919	484.8433369	66.90909091	7.574257426	1756.495486	40.70588235
Median	2.5	10.5728	32	2	14.2654	10
Mode	1	0.7463	30	1	0.8815	0
Standard Deviation	23.36825898	2280.872681	95.18135799	20.66027422	13592.20755	72.98781123
Sample Variance	546.0755276	5202380.187	9059.490909	426.8469307	184748106	5327.220588
Range	199	21182.4009	334	189	141576.9124	294
Minimum	1	0.5991	14	1	0	0
Maximum	200	21183	348	190	141576.9124	294
25th percentile	1	1.7197	28	1	1.7017	0
75th percentile	5	92.6808	59	5	109.9712	45

Table 2. Descriptive Statistics on Datasets without account for change

Fixed effects would not help inference if there are time-varying omitted factors affecting the dependent variable. Therefore, by accounting for change, the time-invariant effect will be removed along with their observed and unobserved source of bias related to this study.



Graph 1: 2014 dataset on exchange rate and number of Applications received.



Graph 2: change from 2014 to 2018 dataset on exchange rate and num. of applications.

That will help in getting a more realistic correlation between the variables. Graph 1 and Graph 2 show how the time-invariant effects are removed, specifically Graph 2 shows a more defined correlation with number of applications.

Taking the relevant pieces of data from the above source and removing countries that may skew the result of this study leaves us with 109 countries. Table 3 shows the descriptive statistics after making the appropriate adjustments in the dataset.

Descriptive Statistics	*Δ in num. of Application*	*Δ in Exchange Rate*	*Δ in num. of Students Visited*
Mean	2.321100917	91.46419083	-0.403669725
Median	1	2.324	0
Mode	1	0.1352	0
Standard Deviation	6.839266711	302.8759462	38.85040618
Sample Variance	46.77556915	91733.83881	1509.35406
Range	61	2117.8106	523
Minimum	-10	-10.8106	-229
Maximum	51	2107	294
25^{th} percentiles	-1	0.1352	0
75^{th} percentiles	3	14.6435	0

Table 3: Descriptive Statistics on Datasets accounting for change from 2014 to 2018

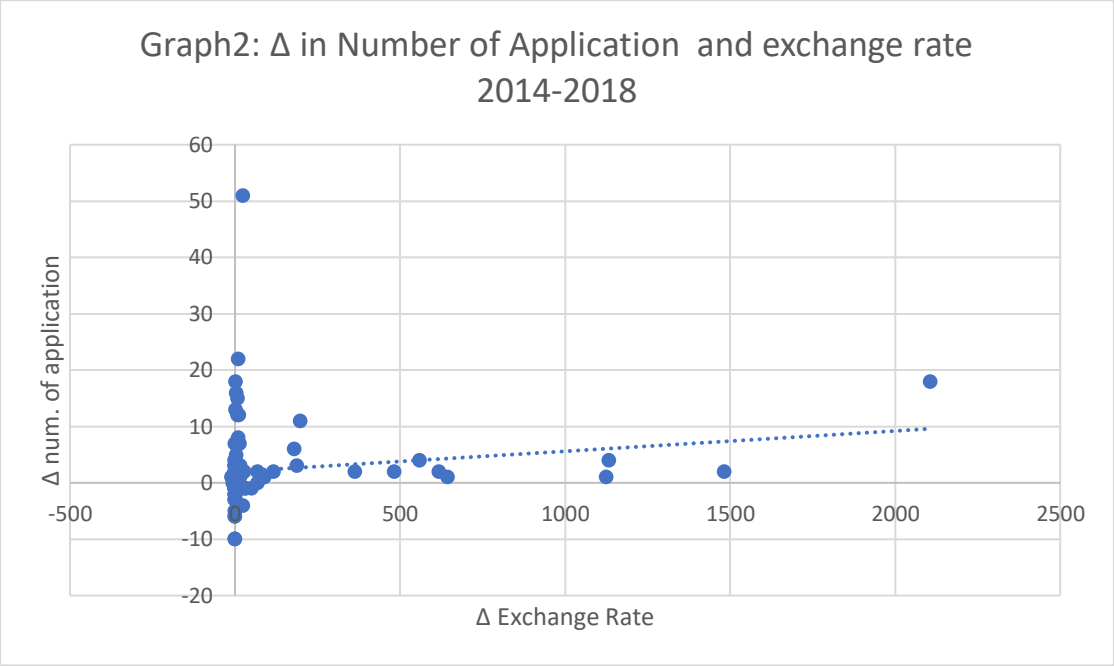
On average, number of applications received internationally increased 232.1% between 2014 and 2018 with standard deviation of about 6.84. In that same time span, exchange rate of the countries on average changed dramatically by 9146.4% with a standard deviation of 302.87. While number of students visited decreased with approximately with 40.4 % with a standard deviation of 38.85. The high standard deviation of explanatory variable change in exchange rate indicates that the data's values are dispersed widely and not consistent with the mean. The chief reason why that might be the case is outliers such as countries that may have had a dramatic economic turn between the year 2014 and 2018. The range, 2117.8106 and the 75^{th} percentiles of 14.6435 also indicates that there may be outliers. However, removing more countries will also affect the result of this study leaving us with a skewed result.

V Analysis

For this study, I chose a significance level of 0.10 to conduct all my tests. I want to decrease the probability of committing a Type II error, which is failing to reject the null hypothesis when it is false. By using a higher alpha level of 0.1, I also increase the power of my statistical tests. And a higher power implies increased probability of rejecting H_0 when it is false. Any significant trends will be captured by 0.1 significance level. On the other hand, a higher alpha level implies higher probability of committing a type I error, which is essentially rejecting the null hypothesis when it is true. A type I error would mean that decisions are made based on exchange rate even though it does not affect the number of students who apply.

However, there is not a lot to lose even if I commit a type I error, increasing the probability of accepting that there is a correlation or decreasing the probability of rejecting when there is correlation is more important in this study since I am trying to gauge if there is any effect that exchange rate may have on number of students who apply.

Graph two contains a scatter plot of the changes in number of applications received and the changes

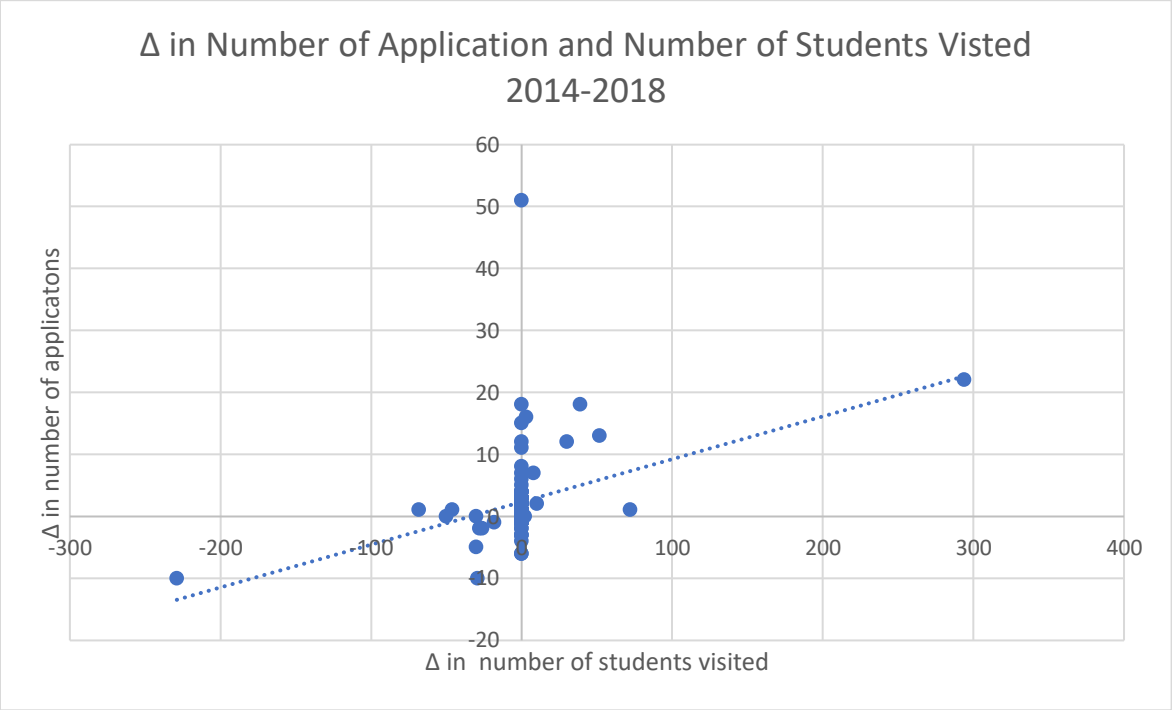


in exchange rate for each respective country that applied between the year 2014 and 2018. The graph's line of best fit shows that there is a positive linear correlation between the two variables. Though some outliers are present, these data are still part of that effect and ignoring or removing those data will affect our results. Overall, this graph indicates that there is a slight positive linear relationship between changes in number of students who apply and changes in nominal exchange rate between 2014 and 2018.

Graph 2. Change in number of applications vs. Change in exchange rate 2014-2018

Graph three, on the other hand, shows a scatter plot of the changes in number of applications received and the changes in number of students visited between the year 2014 and 2018. The graph's line of best fits indicates that there is a positive linear correlation between the two variables. There are outliers

on both spectrum of the graph, however, both those number indicate the true number of visits that the international student's admissions office visited in that specific country at a given time and ignoring those numbers might skew the result of the study.



Graph 3. Change in number of applications vs. Change in number of students visited 2014-2018

The visual trend of theses graphs can be confirmed by the correlation's coefficient between each of my independent variables and change in number of applications. Table 4 shows that the correlations coefficient r of 0.1598 indicates that there is a slight positive relationship between change in exchange rate and change in number of applications. Similarly, the correlation coefficient of 0.3919 indicates that there is a positive linear correlation between change in number of students visited and change in number of applications received.

	Y and X_1	**Y and X_2**	**X_1 and X_2**
H_0	$\rho = 0$	$\rho = 0$	$\rho = 0$
H_1	$\rho < 0$	$\rho < 0$	$\rho \neq 0$
r	0.1598*** (1.675)	0.3919*** (4.4063)	0.1346*** (1.0498)
Numbers in parenthesis are t-statistics. The critical values for the two-tailed test +1.659 and -1.659 at the 10% level. The critical value for the one-tailed tests is -1.289 at the 10% significance level.***,**,* represent significance at 1,5, and 10% levels repectively.			

Table 4. Correlations Coefficient Hypothesis testing for Change in number of applications received and change in number of students visited, and change in number of applications received and change in exchange rate, and change in number of students visited and change in exchange rate, where x_1 represents change in exchange rate, x_2 represents change in number of students visited.

In additions, hypothesis testing on those correlations coefficient to determine whether the coefficient is statistically significant from 0 is also presented on the table 4. Each test was one-tailed left sided test with null hypothesis being $\rho = 0$ and the alternate hypothesis being $\rho < 0$. The p-value for change in exchange rate(x_1) to change in number of application (y) is about 0.048 for a one-tail test, and at significance level of 0.1, we reject the null hypothesis since the p-value is less than the significance value and accept that the correlations coefficient is statistically significant.

Similarly, I also reject the null hypothesis that change in number of students visited and number of applications received are not related since the p-value of the change in number of students visited for one tail test is lower than the significance level of this study.

In addition to the independent two variables against the dependent variable, I also did a hypothesis test on correlations coefficient of change in exchange rate and change in number of students visited. The p-value for two tailed tests was about 0.1627, and so we fail to reject the null hypothesis that those two independent variables are related since the p-value is higher than the significance value. The test indicates that the correlation coefficient between the two independent variables is not statistically significant, and that those two variables are not really related. This does make sense since number of students visited does not really have a significant correlation with exchange rate.

OLS Regression Results			
	Δ in number of students who apply 2014-2018	Δ in number of students who apply 2014-2018	Δ in number of students who apply 2014-2018
Independent Variable	Model (1)	Model (2)	Model (3)
Δ in exchange rate 2014-2018 (nominal exchange)	0.00246 (0.0020)	0.0036* (0.00215)	
Δ in number of students visited 2014-2018	0.0664*** (0.01576)		0.069*** (0.01567)
Intercept	2.1227*** (0.6321)	1.990*** (0.679)	2.349*** (0.6055)
R2	0.165261	0.02555	0.153585
Adjusted R2	0.149511	0.016443	0.145674
Root mean squared error	6.219902	6.720288	6.263252
Number of observations	109	109	109
***, **, and *** indicate significance at the 1%, 5%, and 10% levels, respectively. Standard Errors are reported in parentheses**			

Table 5. Change in number of applications OLS regression estimates for models 1 - 3 (sampling country data from year 2014-2018).

Table 5 contains the linear regression results of changes in a exchange rate between 2014 and 2018 on the changes of number of application over the same period. According to the model, every increase of nominal exchange rate from 2014 to 2018 resulted in an increase in change in number of applications of 0.00246 applications, *ceteris paribus.* Similarly, every increase of number of students visited between 2014 and 2018 was followed by an increase in change in number of applications by 0.0664, *ceteris paribus.* Both explanatory variables are positively correlated with the change in number of applications received between the two years. At a two-tailed test with significance level of 0.1, change in number of students visited is statistically significant since its p-value is less than 0.1. The coefficients are economically substantial in magnitude since the average change in number of applications received between 2014 and 2018 is around 2.32 applications and increasing the mean change exchange rate and number of students visited by just one-unit per country would have an impact on number of applications received from all over the world. Change in exchange rate is not statistically significant according to my hypothesis testing. Similarly, past literatures

have found that exchange rate are not really important determinant of applications received, which is why I will do more test on this coefficient. In addition, I am confounded with the result that change in exchange rate has a positive correlation coefficient since I expected as the country has a stronger currency (represented by lower nominal exchange rate), the more the country would want its students to study abroad. However, it is also possible that as the country has a stronger currency, the more students are to value their country's education and would prefer to study in their home country.

I conducted a hypothesis test on the slope coefficient for change in exchange rate to interpret the power. The hypothesis test of H_0: $\beta_{\Delta \text{ in exchange rate 2014-2018}} = 0$ or H_1: $\beta_{\Delta \text{ in exchange rate 2014-2018}} \neq 0$, the test of whether $\beta_{\Delta \text{ in exchange rate 2014-2015}}$ has a significant effect on the dependent variable Y, yields a power of 47% at 0.1 significance level. This indicates that there is 53% chance that a Type II error is committed in this test, meaning there is 53% chance that the null hypothesis is accepted when it should be rejected. So, given the dataset used in this study, if the change in exchange rate has a significant effect on change in number of applications received, there is 53% chance that this model will not detect it.

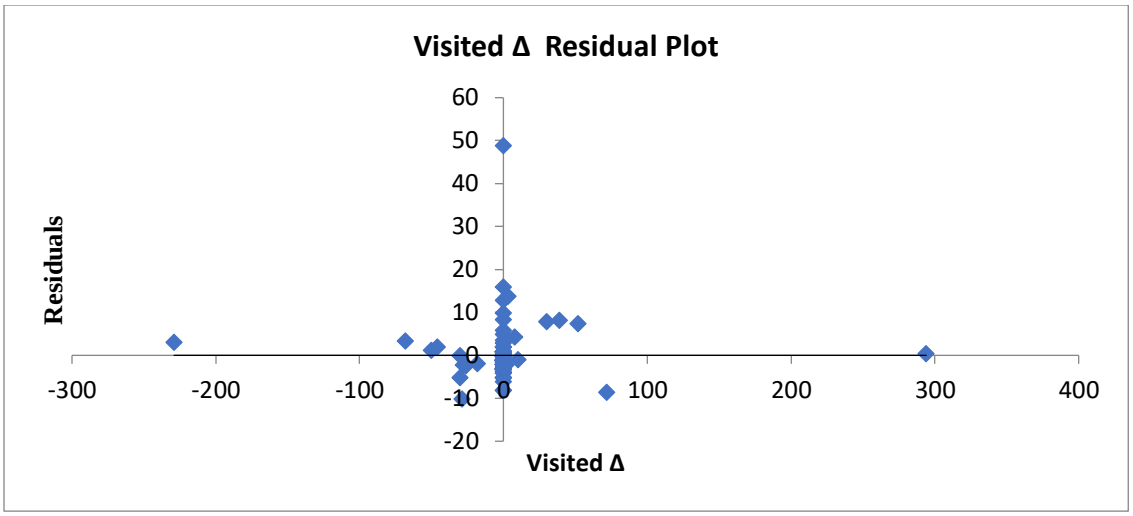
The model's adjusted R^2 of 0.15 indicates that 15% of the variation in change in number of applications received between 2014 and 2018 is explained by the variation in my independent variable. Thus model (1) exhibits a below average goodness of fit, meaning it slightly explains the changes in dependent variable caused by the independent variables. The model's standard error is about 6.307, which indicates that on average, the data points in my sample are 6.307 change in number of applications received off of the model's regression line. The standard error better represents the goodness of fit because its units are the same as the dependent variable and it specifically tells me how far away the data points are from the regression line, unlike an R_2 value. Therefore, the model has a moderately goof-fit to measure the variation of change in number of applications.

In comparing Model (1) to Model(2), there is a very slight increase in the coefficients that is comparable, in other words, there is no drastic increase in the coefficient of the variables. In addition, comparing the adjusted R^2 and standard error with Model(2) and Modal(3), there is a change in R^2 of model 2, which shows that the fit of the model for change in exchange rate is not that good. Model 3, on the other

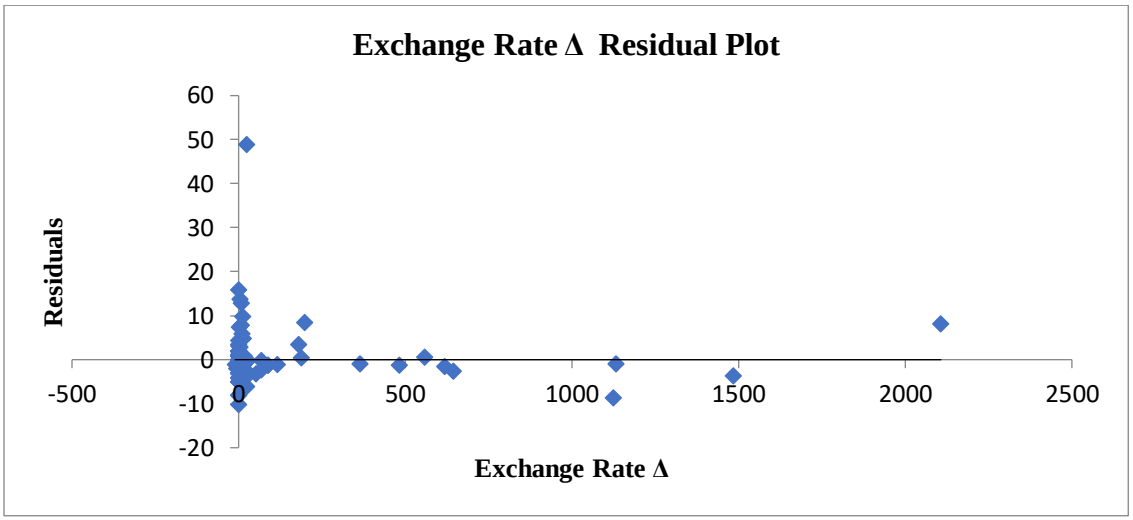
hand has a closer standard error and R^2 to Model(1), which indicates that if we remove the explanatory variable change in exchange rate, the effect of the model would not change by a significant value. It is for this reason that Model (1) and Model(3) have close results while the model for change in exchange rate (Model(2)) shows a different result.

It is important to test whether these assumptions hold true to guarantee that my model is unbiased and efficient. The first assumption states that expected value of the error term for any given value of the independent variable is 0 ($E[\varepsilon_i| X] = 0$). This means the model's error term should not be correlated with either of my two independent variables. The mean error term for the model 1 is around $1.47x10^{-16.}$ Although that number is close to zero, it does imply a very weak association between the residual and the dependent variable. Furthermore, our hypothesis testing has shown the slope coefficients are statistically significant at the 0.1 alpha level. As a result, the first Gauss-Markov assumption does not hold true. This implies that other additional independent variables must be pulled out from the error term to be added to the model to predict the true change in the dependent variable. In addition, among other things the coefficient of change in number of students visited has been going down throughout the years because of technology. The more the youth is technology dependent, the more students search the college's website instead of attending the college fair to meet advisors from the college, and since our data on change in number of students visited does not include those who look at the website, that might have caused omitted variable bias.

The second Gauss Markov assumption is that the error variance is constant across all independent values (homoskedestic error). This is can be informally tested by observing the residual plots that excel outputs (Graph 4 and 5). The vertical variation of the residual about the x-axis seems consistent in both residual plots, so the second assumption seems to not be violated. This is confirmed by the Breusch-Pagan test. The significance value for the whole model F-test is 0.993 which is greater than my alpha value of 0.1, so I fail to reject the null hypothesis which assumes that the error terms are distributed normally. The variability of the residuals *does not* vary as the independent variable does. Therefore, the second Gauss Markov assumption holds true for this dataset.



Graph 4: Residual plot of change in number of students visited



Graph 5 : Residual plot of change in exchange rate

The third assumption is that there is no serial correlation, which means that observation of the error terms are not corelated with each $Cov[\ \varepsilon i.\varepsilon j\ |\ X]=0, i\neq j$. I do not expect a serial correlation in this study since the data is about change in number of application and its correlations with change in number of students visited and change in exchange rate between the year 2014 and 2018. Running a Durbin-Watson test at the 0.05 significance level clears this up, as the resulting d test statistic of about 2.174 exceeds the lower critical value of about 1.502 and the upper critical value of 1.582 when $n = 109$ and $k = 2$. From this, the hypothesis that ρ between errors is greater than zero cannot be rejected, and autocorrelation is not

identified in the model. This is because the data are ranked alphabetically. If I ranked the data geographically, it may be possible to see a spatial series correlation since students who apply to colleges might be related geographically.

The model also seems to fulfill the fourth assumption of the Gauss-Markov theorem, that it contains linear parameters. None of the model's explanatory variables interact with the dependent variable in such a way in that a change in one could lead to a non-linear change in the other. The fifth assumption of Gauss-Markov theorem is likely to hold true here since the central theorem of my dataset is composed of a large sample.

My results for change in exchange rate are variable are not consistent with other studies. Abbott and Ali (2009) found that exchange rate is statistically significant among other variables, and in addition, the sign of the slope they got was a negative, indicating a negative correlation between Change in exchange rate and Change in number of applications. For my study, I got a positive slope that is not statistically significant, and the sign of the slope was positive.

Conclusion

The result of this study indicates that there is significant relationship between change in number of applications with change in number of students visited and but not with change in exchange rate. Hypothesis testing on the slope confirmed that the slope for change in number of students who apply are statistically significant. Since the tests are done with alpha level of 0.1, other studies may have different results with other lower alpha levels. The results show that change in exchange rate is correlated positively with change in number of applications received supporting the interpretation that one-unit increase in change in exchange rate increased the number of applications received by 0.00246 assuming other variables are held constant between the year 2014 and 2018. This information may be useful for college counsellors who try to know whether exchange rate has an effect in international students' admission. Change in number of students visited also has a positive correlation with change in number of applications between the year 2014 and 2018, implying that as the college talks to more students in international college fairs, the more

the students from that country apply. With numbers, a one-unit increase in number of students visited in a country increased the number of applications by 0.0664, assuming other variables are held constant. This information is also useful for admission office to know where they need to visit in order to attract more students to their colleges. There is, however, some limitation to this relationship because of the missing data from some countries and violations of the Gauss-Markov assumptions. More extensive research needs to be done with more control variables to find a direct association.

VI. Conclusion

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