China: Friend or Foe?

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A World View of Mathematics and Data Analysis
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Abstract

International trade is a vital part of a country's economy. For the United States, the largest international trade occurs with China, reaching about 366 billion dollars a year, according to a 2009 data. However, despite this huge amount of trade, is the economic relationship between United States and China actually a beneficial one for the United States? In an attempt to evaluate the positivity or the negativity of the economic relationship, this paper analyzes five different economic factors: the effect of rising hourly Chinese labor to the monthly consumer price index rate of United States, the amount of United States' trade surplus or the trade deficit per year, the amount of money lost due to outsourcing of jobs to China, the effect of growth in total United States' trade with China to the United States' per capita income, and United States' debt to China and its importance. Despite the fact that United States is an economically stronger and much more developed country compared to China, the results of the test were very devastating for the United States. It was found through a linear regression test that there was a positive linear relationship between the rising hourly Chinese labor cost and the rising United States' consumer price index. In addition, the hypothesis testing proved that there was a 105 billion dollar trade deficit for the United States each year since the year 2000. Also, the loss due to outsourcing of jobs to China amounted up to 79.5 billion dollars. The only positive factor was that there was a positive linear relationship between the growth in total trade and the growth in United States' per capita personal income. The remaining factor, United States' debt to China, which was estimated to be at most one trillion dollars according to various sources, can be both positive and negative. Overall, the economic relationship between United States and China was evaluated to be a negative one.

Background

Since the time of the early river valley civilizations, China had maintained its economic dominance until the early 19th century. China had such a grand scale of trade that it was the first to participate in the global trade with the travels of Zheng He during the Ming dynasty. Its dominions extended far beyond Asia and Europe. Some historical pictures have proven that China had traded with Africa as early as 1410's. Also, evidence was found showing that China had contact with America before the Europeans. However, its dominance started to deteriorate in the late 19th century, as China failed to experience industrialization like its counterparts in Europe. Since then, China has remained a third nation, seen as a minor Asian country with a vast number of people. However, despite the fact that China has been held back by the lack of industrialization, now it says, "Not too fast."

China is on the rise again. The recent economic activities show that China is growing at an astonishing scale of an average of 10% annual economic growth. It's in such a grand scale that China is predicted to catch up with the United States, the center of the world economy, in just a few decades. The growth rate of China is unbelievable, but what matters more, as Americans, is how it is affecting the United States. Is United States still dominating the economic relationship with China? Or, is the game turned around? The money war is on. Will the "Coca-Colanization" of the United States continue on? Or will the new trend of "Chinesation" begin?

Research Question

Looking at five different economic factors, the effect of rising hourly Chinese labor to the monthly consumer price index rate of United States, the amount of United States' trade surplus or the trade deficit per year, the amount of money lost due to outsourcing of jobs to China, the effect of growth in total United States' trade with China to the United States' per capita income, and United States' debt to China and its importance, is China our economic friend, or, foe? The data is based upon recent economic activities with the oldest data being of year 2000. All the factors are analyzed through either a linear regression testing, a hypothesis testing, or estimation based upon reliable sources. If the overall gain, or surplus, is greater than the overall loss, it could be concluded that United States and China has a "friendly" economic relationship. However, some factors may contribute to the relationship in different ways, and therefore, those are accounted as well.

Methods

A linear regression test is used to determine the positivity or the negativity and the strength of the correlation between the data sets, x and y. In a linear regression testing, r is the linear correlation coefficient which measures how strong the correlation is and whether the correlation is positive or negative. The linear correlation r is a number between -1 and 1, -1 being the strongest negative correlation possible and 1 being the strongest positive correlation possible. If there is no correlation at all, the r value would be 0.

$$\frac{\qquad\qquad}{\qquad\qquad}$$, where n= the total number of data (x, y).

The r^2 value is the number that describes the percentage of variance between x and y that can be explained by the linear regression. The values range from 0 to 1 with 1 being 100%. The linear regression is described as , where a is the y-intercept and b is the slope.

The slope b= ——————

The y-intercept a = — —.

A hypothesis testing is used to test whether the positivity or the negativity of a correlation is valid. There are two hypotheses, the null, H_o, and the alternative, H_a. Since I will be only validating the positivity of a relationship, the hypotheses are: H_o: $p \leq 0$ and H_a: $p > 0$, and the alternative, H_a, would always be my claim. In addition, my testing would always be one-tailed right testing. The degree of freedom is equal to n-2 since there are two sets of data, x and y. Also, the α-level is the probability that my claimed hypothesis will be rejected. Using the degree of freedom and the alpha level, the critical value is found using a t-chart. The t-distribution test statistic must be greater than the critical value and fall under the rejection region in order to reject the null hypothesis, H_o, and claim that the alternative hypothesis, H_a, is true.

T-distribution test statistic t*= ———,
——

Meaning, if the hypothesis test rejects the null hypothesis, there is a positive correlation, whereas if not, there is not a positive correlation.

In addition to a linear regression hypothesis testing, a mean comparison hypothesis testing is used to compare two data. It is the same concept, where there are two hypotheses, a critical value, a rejection region, and a t-distribution test statistic. If the test statistic falls under

the rejection region, H_o is rejected, if not, H_o is failed to be rejected. The t-distribution test statistic in this testing is different.

$$T^* = \frac{\quad}{\quad}.$$

1. The effect of rising Chinese hourly labor cost to the consumer price index rate of United States

First, the linear regression needs to be found, and then a hypothesis test validating the positivity or the negativity of the correlation is carried out.

Preliminary Data

$\sum x = 40.8$ $\sum x^2 = 28.1664$ $n = 60$

$\sum y = 11395.3$ $\sum y^2 = 2168021.49$ $\sum xy = 7787.9$

In order to find the linear regression (y=a+bx), we must find the y-intercept, a, and the slope, b.

$$b = \frac{\quad}{\quad} = \frac{\quad}{\quad} = 92.55681818$$

$$a = \frac{\quad}{\quad} = \frac{\quad}{\quad} = 126.9830303$$

So, the linear regression is $\hat{y} = 126.9830303 + 92.55681818x$. In addition, in order to validate the positivity at alpha level of .01, a hypothesis testing is done.

1) Hypothesis: H_o: $p \leq 0$ and H_a: $p > 0$ (Claim)

2) Critical Value: The alpha level is .01 and n>30, therefore the critical value z*= 2.326

3) Test Statistic: In order to calculate the t-distribution test statistic, the r and r^2 values are needed.

   r= ——————————————= ——————————————————————

   = .9749267433, thus R^2= .9504821548

   T-distribution test statistic (t*) = ——— = ——————— = 33.36607403

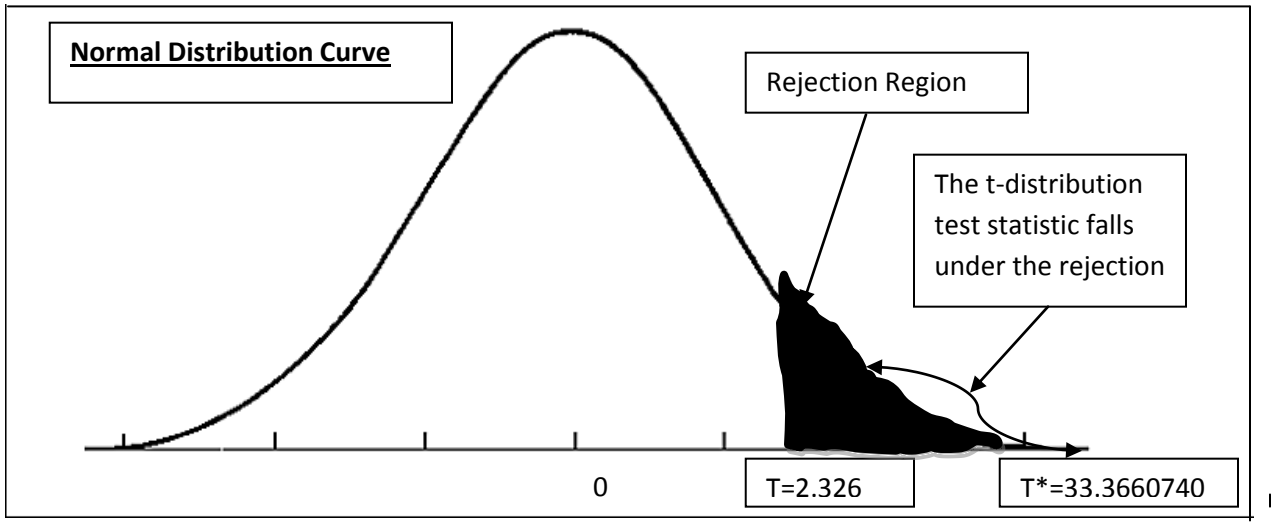

Figure 1

4) Decision: Since, the T-distribution test statistic is greater than the critical value, it falls under the rejection region, thus the null hypothesis, H_o, is rejected.

5) Conclusion: This test shows that there is sufficient evidence at the alpha level of .01 to claim that there is a positive linear correlation between the rising Chinese hourly labor cost and the rising United States' consumer price index.

2. The amount of United States' trade surplus or the trade deficit per year

A mean comparison hypothesis testing is necessary to validate the trade surplus or the trade deficit. In the following test, the claim is that the mean United States' trade deficit is greater than 105 billion dollars per year.

Preliminary Data

N=9 =207.4666667 S_1=93.71992851 α-level=. 05

Degree of Freedom=8 =39.3777778 S_2=20.41897266

1) Hypothesis: H_o: ≤105 and H_a: >105 (Claim)
2) Critical Value: Since the degree of freedom is 8 and the alpha level is .05, the critical value (z*)= 1.860
3) Test Statistic t*:

=

=

=2.911

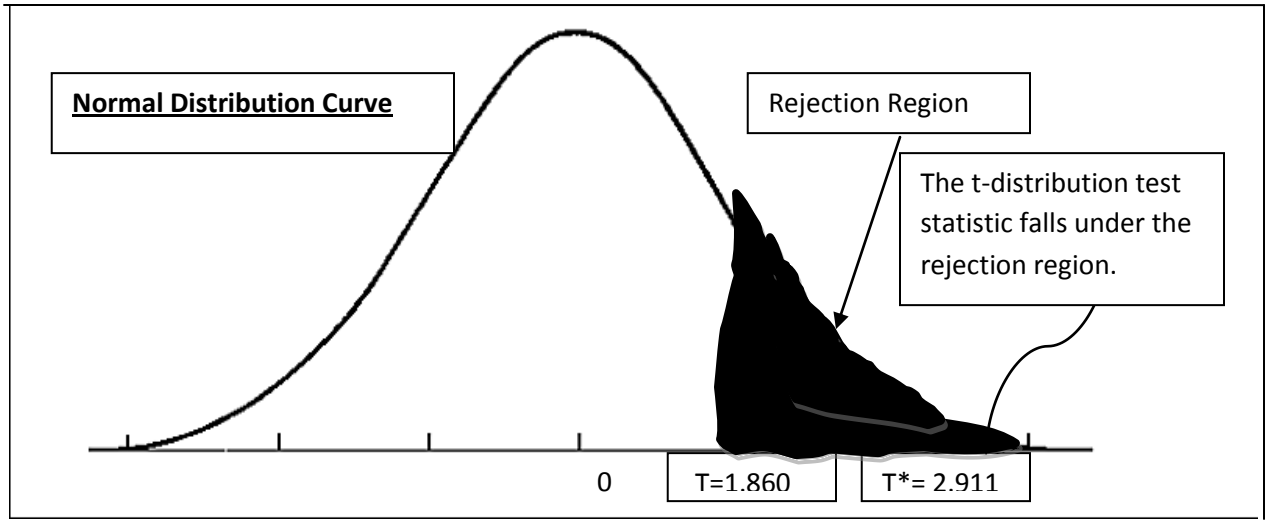

Figure 2

4) Decision: Since the T-distribution test static is greater than the critical value and falls under the rejection region, the H_o is rejected.
5) Conclusion: There is sufficient information at the alpha level of .05 to claim that the mean trade deficit for United States per year is greater than 105 billion dollars.

3. The amount of total money loss due to outsourcing of jobs to China

According to Robert E. Scott of the Economic Policy Institute, the rise in the United States' trade deficit with China between 1997 and 2006 has displaced production that could have supported 2,166,000 American jobs. Therefore, I have calculated the total loss of money by multiplying the number of potential jobs lost and the United States' per capita income for 2006, $36,714.

= 79,522,524,000.

The total loss is estimated to be 79.5 billion dollars.

4. The effect of growth in total United States' trade with China to United States' per capita income

First, the linear regression needs to be found, and then a hypothesis test validating the positivity or the negativity of the correlation is carried out

Preliminary Data

$\sum x = 1812.3$ $\sum x^2 = 484801.81$ $n = 8$

$\sum y = 265845$ $\sum y^2 = 8905070523$ $\sum xy = 62504052.5$

In order to find the linear regression (y=a+bx), we must find the y-intercept, a, and the slope, b.

b = ——————— =————————————— = 30.71050967

a =—— —— =——— ———= 26273.54292

So, the linear regression equation is y= 26273.54292+30.71050967x. However, a hypothesis testing is done to prove the positivity of the linear regression at the alpha level of .01.

1) Hypothesis: H_o: $p \leq 0$ and H_a: $p > 0$ (Claim)

2) Critical Value: The alpha level is .01 and the degree of freedom is n-2, which is 6, therefore the critical value= 3.143

3) Test Statistic: In order to calculate the t-distribution test statistic, the r and r^2 values are needed.

r = ——————————————= ——————————————————————

= .9939911345, thus R^2= .9880183755

T-distribution test statistic= ——— = ——————— = 22.243

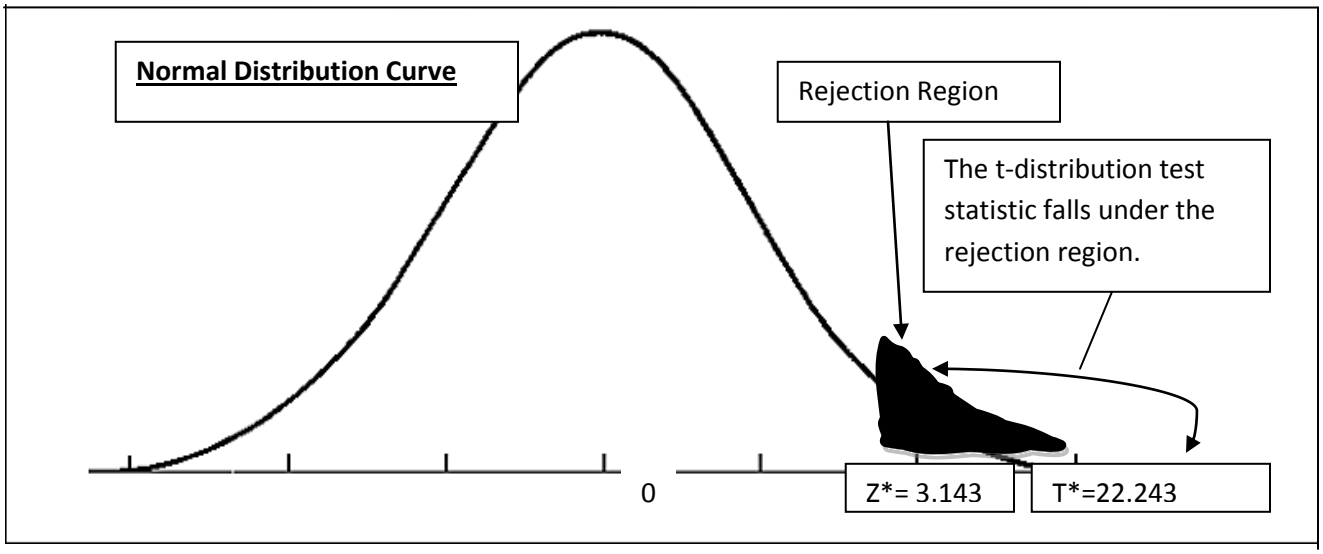

Figure 3

4) Decision: Since, the T-distribution test statistic is greater than the critical value, it falls in the rejection region, thus the null hypothesis, H_o, is rejected.

5) Conclusion: This test shows that there is sufficient evidence at the alpha level of .01 to claim that there is a positive linear correlation between the rising Chinese hourly labor cost and the rising United States' consumer price index.

5. United States' debt to China and its importance

The exact amount of United States' debt to China is not known publically. However, it can be estimated based on different sources. According to the Retired Military Personnel, the amount is 772 billion dollars. However the Tokyo United States embassy claims it to be 820 billion dollars. In addition, according to the Washington Times, it is indicated to be 900 billion dollars, where as some extremists amplify the amount by estimating it to be over 1.7 trillion dollars. According to these numbers, United States' debt to China has been assessed to be 1.0 trillion dollars for the purpose of this paper.

Results

I. The effect of rising Chinese hourly labor cost to the consumer price index rate of United States

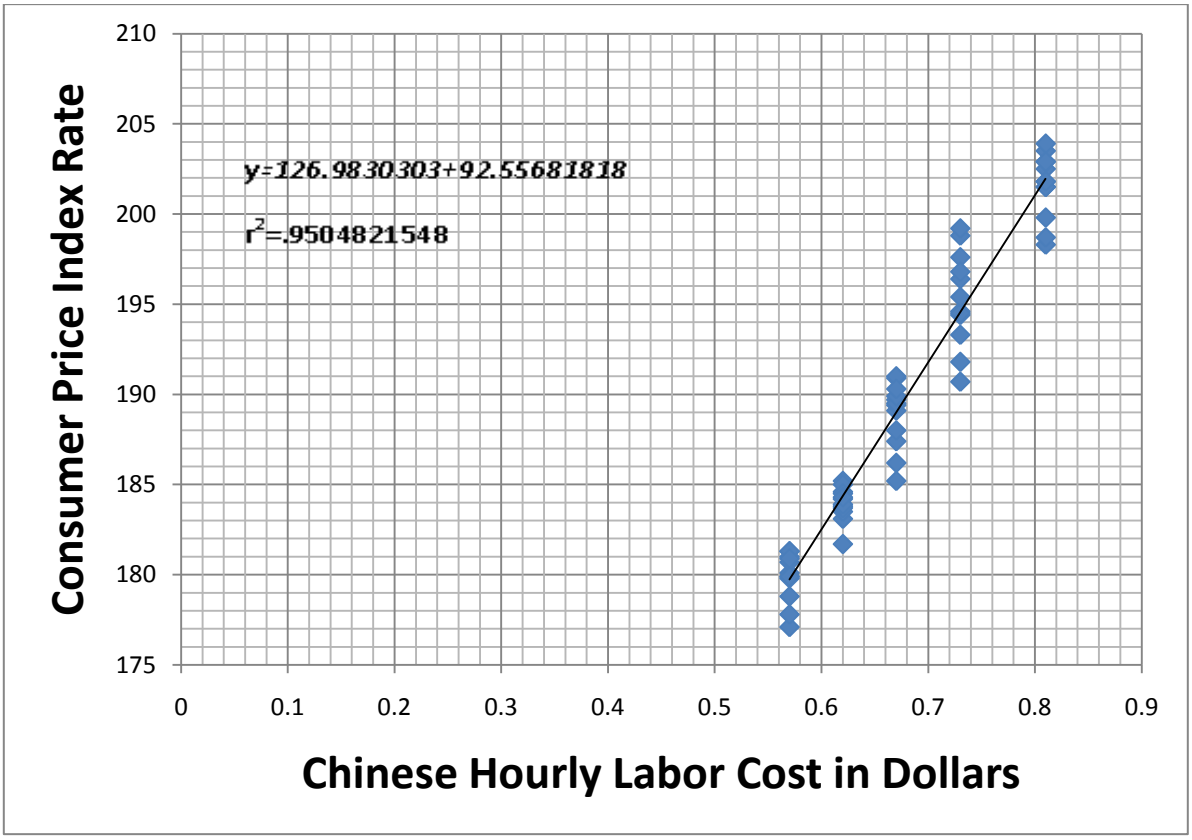

Figure 4

The graph shows a positive correlation between the Chinese hourly labor cost and the consumer price index rate of United States. It means that as the Chinese hourly labor cost rise, the consumer price index rate rises at the same time. This result reflects the level of United States' dependency on China for basic consumer products.

II. The amount of United States' trade surplus or the trade deficit per year

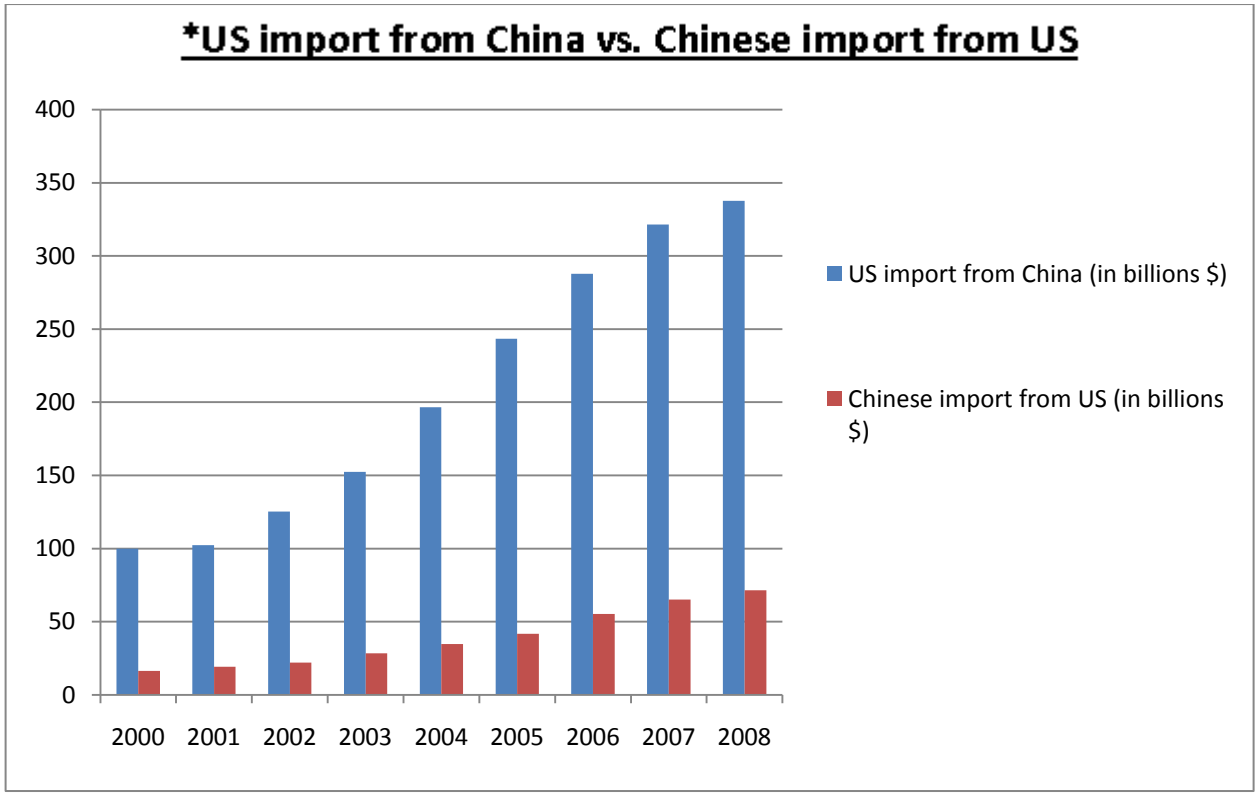

Figure 5

Through the hypothesis testing, it was concluded at 95% confidence that there has been an annual trade deficit of 105 billion dollars for the United States with China since 2000. This result concludes that the current trade relationship significantly favors China.

III. The amount of total money loss due to outsourcing of jobs to China

It was estimated that the potential total loss amount up to 79.5 billion dollars. Despite the fact that it is natural for the manufacturing jobs to be shipped over from a developed country to a developing country, the amount of loss due to outsourcing to China appears to be too much

and too dangerous for the United States economy. Also, the fact that the United States' service sectors are not so popular in China compared to those of other Asian countries such as Japan and Korea makes this trade balance to be so unfavorable for the United States.

IV. The effect of growth in total United States' trade with China to United States' per capita income

Figure 6

The graph shows a positive correlation between the total trade between United States and China and the per capita personal income of United States. The increase in the total trade between the two nations has contributed to the rising per capita personal income for American citizens. This result illustrates that despite the fact the trading relationship is hurting the United States economy as a nation, the process of trade actually contributes positively to each individual and her personal income.

V. United States' debt to China and its importance

The United States' debt can be evaluated in both positive and negative ways. Positively, the fact that China lent a trillion dollars to United States means that United States has been able to maintain and operate its economy thanks to China's money supply. However, the United States' economy has become vulnerable and exposed. China can easily dump the government bonds and securities and cause United States' economy to collapse instantaneously. However, it is highly doubtful because it will cause China's economy to fall simultaneously.

Conclusion

The United States had dominated the world economy since the fall of Soviet Union as the sole super-power. However, today, China is growing rapidly and becoming the major economic power nation along with the United States. These two nations, United States and China, have become unbreakable through an economic relationship that is vital for both of the nations. Indeed, looking at the fact that their annual trade amount to almost 500 billion dollars, the one dominating this economic relationship is profiting in a grand scale. According to my results of the tests for the five economic factors, China stood up to be the winner of this economic relationship.

The first test has shown that there is a positive relationship between the hourly Chinese labor cost and the United States' consumer price index. It means that as the hourly Chinese labor cost increased, the United States' consumer price index follows. This fact shows the United States' dependency on China. One of the main reasons the United States have such an unfavorable relationship is that it has failed to import from other nations. Rather, it relies only upon China for its consumer products, thus becoming vulnerable to inflation as the labor cost in China increased.

The mean comparison hypothesis testing done on the amount of each country's import from the other shows that there was a 105 billion dollar annual trade deficit for the United States since 2000. This result demonstrates how undesirable situation the United States is in regarding the international trade balance. According to this, the United States' service manufacturing sector is not exporting enough to China compared to how much the United States import from

Chinese manufacturing sector. The results have proven that United States' service sector is not competent against those of Japan and Korea in the world market.

Outsourcing of jobs to China has been a great problem for Americans. According to my result, there has been a total loss of 79.5 billion dollars since 1996 due to jobs going overseas to China. The process of outsourcing of manufacturing jobs to developing countries like China seems natural and reasonable. However, the amount, 79.5 billion dollars, appears to be extreme. This data illustrates how much jobs have gone overseas and about how United States' has to depend more on China since its manufacturing labor force has been replaced by the Chinese labor force.

Despite the fact that United States was hurt as a nation due to the unbalance of trade, its people benefited from the trade relationship. It is shown that the increase in total trade between the two nations contributed to the rising United States' per capita personal income. This result means that despite the fact there is a trade deficit for the United States, the everyday Americans benefits through other ways such as business opportunities as the total trade increases.

An average American may be glad to know that China is contributing to their personal income, however, one need not forget about United States' debt. The gargantuan amount, one trillion dollars, gives China a power to manipulate United States' economy in addition to having a favorable trade relationship. The one trillion dollars are composed of economic instruments such as government bonds and securities, and China virtually has the power to manipulate the value of the bonds and securities. Despite the fact that it is highly doubtful that China would do so since the fall of American economy means the fall of its economy, the United States has to be aware of the danger. As a communist nation, China previously has been accused of

manipulating its economy and currency even after imposing Capitalism. Today, with that one trillion dollar, China holds the power to manipulate United States' economy as the Jewish Rothschilds did to Europe in the 19th century.

The "survival of the fittest", one of Charles Darwin's theories of evolution, explains that only the strongest and the best survive in this world. Same goes for the world of international economy: only the stronger and richer countries hold power. Recently, China has accelerated to be the top growing and developing nation in the world and is predicted to be on the same level as the United States, who is the strongest of the nations, today. The United States has an economic tie with China that cannot be broken, and my analysis proves that the relationship favors China. What the United States needs to do is to turn the game around now, or it will never be able to dominate the world economy again. The United States needs to focus on making its service sector products competent in the world market and stop the dependency on China and start importing from other under-developed countries for its consumer products. Even though the United States is not so hasty about bettering this economic relationship now, this unfavorable trend of economic relationship could lead it to fall behind other countries in a few decades. Reaching the top has been a difficult process for the United States, but now as the economically top nation, it needs to realize that it takes ten times more work to maintain its place.

Appendix

Month/Year	Hourly Labor Cost in China in $	CPI Rate in US	Month/Year	Hourly Labor Cost in China in $	CPI Rate in US
Jan 2002	.57	177.1	July 2004	.67	189.5
Feb 2002	.57	177.8	August 2004	.67	189.9
March 2002	.57	178.8	Sept 2004	.67	190.9
April 2002	.57	179.8	Oct 2004	.67	191
May 2002	.57	179.9	Nov 2004	.67	190.3
June 2002	.57	180.1	Dec 2004	.67	190.7
July 2002	.57	180.7	Jan 2005	.73	191.8
August 2002	.57	181	Feb 2005	.73	193.3
September 2002	.57	181.3	March 2005	.73	194.6
October 2002	.57	181.3	April 2005	.73	194.4
November 2002	.57	180.9	May 2005	.73	194.5
December 2002	.57	179.9	June 2005	.73	195.4
Jan 2003	.62	181.7	July 2005	.73	196.4
Feb 2003	.62	183.1	Aug 2005	.73	198.8
March 2003	.62	184.2	Sept 2005	.73	199.2
April 2003	.62	183.8	Oct 2005	.73	197.6
May 2003	.62	183.5	Nov 2005	.73	196.8
June 2003	.62	183.7	Dec 2005	.73	198.3
July 2003	.62	183.9	Jan 2006	.81	198.7
August 2003	.62	184.6	Feb 2006	.81	199.8
September 2003	.62	185.2	March 2006	.81	201.5
October 2003	.62	185	April 2006	.81	202.5
November 2003	.62	184.5	May 2006	.81	202.9
December 2003	.62	184.3	June 2006	.81	203.5
Jan 2004	.67	185.2	July 2006	.81	203.9
Feb 2004	.67	186.2	Aug 2006	.81	202.9
March 2004	.67	187.4	Sept 2006	.81	201.8
April 2004	.67	188	Oct 2006	.81	201.5
May 2004	.67	189.1	Nov 2006	.81	201.8
June 2004	.67	189.7	Dec 2006	.81	189.5

Table 1. – Hourly Chinese labor cost vs. Consumer Price Index Rate in United States

Year	US from China (in billions $)	China from Us (in billions $)
2000	100	16.3
2001	102.3	19.2
2002	125.2	22.1
2003	152.4	28.4
2004	196.7	34.7
2005	243.5	41.8
2006	287.8	55.2
2007	321.5	65.2
2008	337.8	71.5

Table 2. – U.S. import from China vs. Chinese import from U.S.

Year	Total Trade in billions $	US Per Capita Income in $
2000	116.3	29,845
2001	121.5	30,574
2002	147.3	30,810
2003	180.8	31,484
2004	231.4	33,050
2005	285.3	34,757
2006	343	36,714
2007	386.7	38,611

Table 3. – Total trade between U.S. and China vs. U.S. per capita income

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