

Math Final Project

The relationship between Economy and Mathematics

Math 2270 Section 002

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To view the development of human race and economic history, Mathematics always is a useful tool to persons, companies, and countries. In the macroscopic view, math can help government to make the financial budget and calculate the market quotations. In the microcosmic view, math also helps people and companies analyze revenue and cost.

We will talk about the Gross Domestic Product (GDP) of the United States from 1992 to 2012. From the mathematics, we think the overall trend of GDP is increasing from 1992 to 2012 but part of time is decreasing. There are two parts in this project. They are economic analysis and mathematic analysis.

In the economic analysis, I will display a line chart and a bar chart in the below.

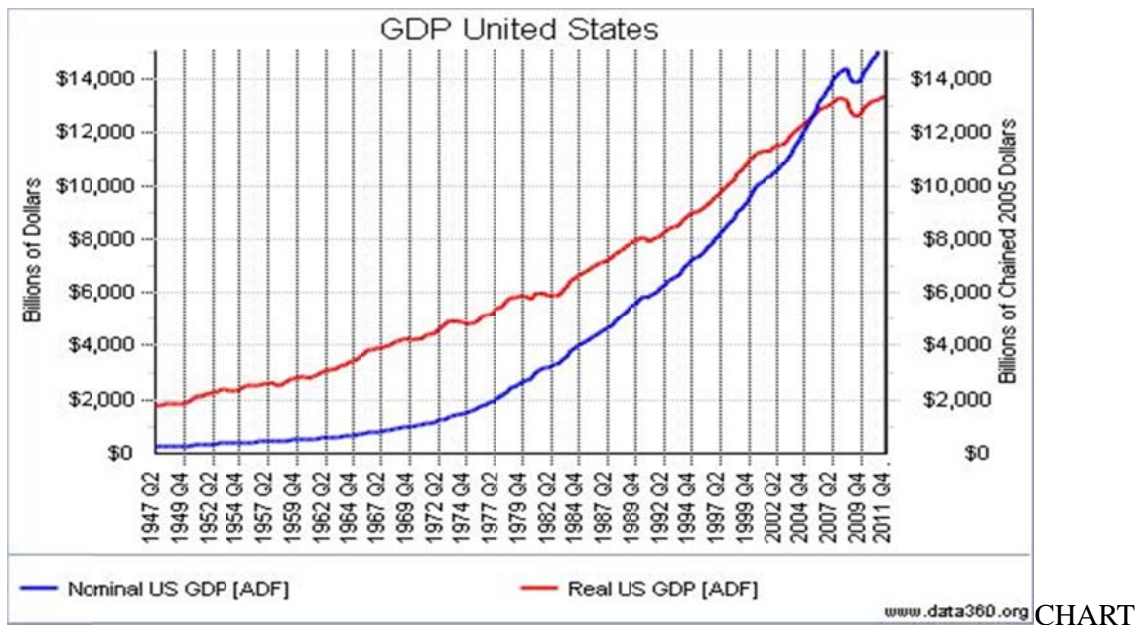


Chart 1 showed us the different between nominal US GDP changing rate (Blue Line) and the real US GDP changing rate (Red Line). In the detail, from the blue line, the line chart is increasing from 6,000 to 14,000 billions of dollars during 1992 to the middle of 2007. In particular, from the past to the middle of 2007, The GDP was reached the peak at 14,000 billion of dollars. After the middle of 2007, the subprime crisis was busted caused by lots of reasons. The GDP rate was changed to decrease from over 14,000 to below 14,000. From the chart we can see, The GDP rate was increasing again after 2009 and Keep growth rate after 2011.

From the other side, the red line (the real US GDP changing rate) is a little bit different from the nominal US GDP changing rate. To be specific, the rate of the red line was repeatedly increasing and decreasing. But the overall changing rate is increasing from 1947 to 2011. Form the chart we can see the same position with the blue line at the middle of 2007. The changing rate was decreased. But it is interesting that the real US GDP rate is lower than normal US GDP rate after the middle of 2004.

From the chart 1, we can see clearly that the GDP keeps increasing from the past to 2011 even the subprime crisis was busted. Thus, we conjecture that the GDP is still increasing after 2012 with little rise and fall.

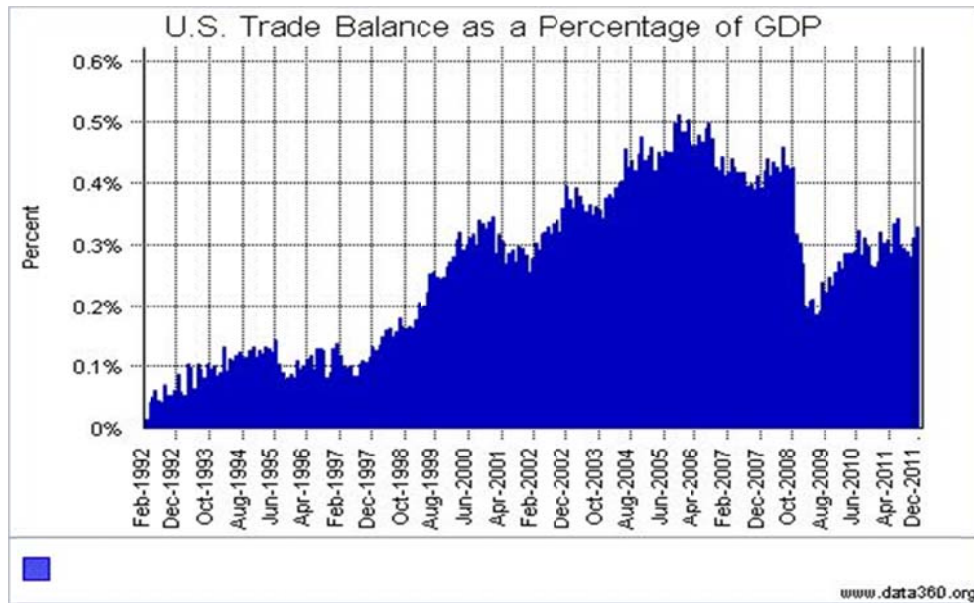


CHART 2

Chart 2 showed us the US trade balance as a percentage of GDP from 1992 to 2011.

From this chart, we think the percentage of GDP rate has a large change but it is never negative. In the chart 2, the increasing rate is different. Especially from December 2007 to June 2010, the percentage of rate was decreasing but still positive. Thus, we think the GDP is increasing from past to now.

In the second part, we will analyze why GDP is increasing by mathematics.

According to data, at first, I defined $A := \text{Matrix}(65, 65, [])$: consumption matrix of zeros 65×65

for j from 1 to 65 do

for i from 1 to 65 do

A [i,j]:=Use Matrix [i,j]/ Total Output Vector[j];

End do: end do:

Norm ((A⁺) - A); A is not early symmetric

2.66087120551529122

Id:=Matrix(65,65,shape=identity):

Determinant (Id-A): Nonzero, so lambda 1 is not equal to 1

0.00519526469884434

then p1:=Eigenvalues(A): complex eigenvalues appear

Inverse of Identity Minus A:=(Id-A)⁽⁻¹⁾:

We can find all entries are nonnegative!!!!

And next, for i from 1 to 65 do abs (p1[i]);end do

(0.4868125034417885)

(0.34348111511215546)

(0.2764942215828645)

(0.2764942215828645)

(0.27102651618996754)

(0.17705008451527957)

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(0.2184448064759002)

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(2.0786850789887324e-4)

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(2.691219285000009e-4)

(7.581453066202502e-13)

(7.581453066202502e-13)

We can notice all eigenvalues of A have modulus less than one.

At last Look for negative entries of $(I-A)^{-1}$

for i from 1 to 65 do

for j from 1 to 65 do

Inverse $(A,55,1)=0$.

Inverse $(A,55,2)=0$.

Inverse $(A,55,3)=-0$.

Inverse (A,55,4)=-0.

Inverse (A,55,5)=-0.

Inverse (A,55,6)=-0.

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According to above data we can get a conclusion, all entries of inverse of I-A are nonnegative!!

Base on above stuff we can easy get: 1.All entries of A are nonnegative.

2. All eigenvalues of A have modulus less than one.

3. All entries of the inverse of $I-A$ are nonnegative.

In this project I try to use two different ways to get the same answer. Seems like the picture added much more authority to the economic analysis, but we have to know, any economic analysis is base on the data, and if these data without using mathematic analysis, they are useless.

Anyway, for me the best idea is combine these to solve the problem, because they can totally complement each other!