U.S. Free Trade Deficit Correlated To As Much As Half of the U.S. National Debt

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Abstract
The U.S. free trade deficit has accumulated to $6.57 trillion over the last 20 years and $7.5 trillion since 1971. The U.S. national debt now totals around $12.1 trillion. In fact, from 1990 to 2007 the trade deficit totaled $5.51 trillion which was fairly close to the national debt in those years that totaled $6.1 trillion. Thus, the trade deficit has accumulated to a sum of the same type of magnitude as the national debt. For every type of trade, whether it is an import or an export, there are tax consequences. Such consequence of a trade deficit may be correlated to the national debt. Our study in fact finds that there exists in the raw data an 87% mathematical correlation between the national debt and the free trade deficit in logically selected time periods when stable (non excessive) government spending and trading occurred. As well the X-Y relationship observed in the raw data indicates the trade deficit is mathematically correlated to as much $6.4 trillion, a little over half of America's current national debt.

1 Introduction

The investigation provided here, shows a fairly strong mathematical correlation between the free trade deficit and the national debt. Correlations are sought all the time in many areas. For example in health, we know that being overweight is correlated to diabetes; smoking has been correlated to lung cancer and emphysema, and so forth.

The concern is a trade imbalance also provides tax consequences representing a combination of ways in which taxes are collected depending on the type of trade (import vs. export) for goods and services. As a simple example, the U.S. collects tax revenues on U.S. worker salaries for exported services compared to imported services for which no salary taxes are collected from foreign workers. This illustrates one simple difference in tax consequences that can occur depending on the type of trade imbalance. Other types of tax consequences are provided in Appendix A.

Despite the complex nature in interpreting the origin of the national debt data and tax consequences occurring in different types of trading, mathematically we can simply look at the raw data to see if there is in fact a correlation. Here we find that the raw data indicate a reasonably strong correlation of about 87% in select time periods between 1990 and 2008. In order to identify the possibility of a mathematical correlation, logically certain years are able to reveal the underlining relation better than other periods in the historical data set (see Table 1). For example, the two can be unrelated in certain periods. We know that the trade deficit in 1990

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to about 1995 was minimal compared to the national debt (see Table 1). At this point in time where the free trade deficit was just starting to accumulate, they would be hard to identify an underlying correlation. Similarly, one would anticipate a weaker correlation in 2008 and 2009, since the U.S. government expenditures have been highly irregular due to the modern recession compared to the free trade deficit which has dropped dramatically due to the recession.

We would like to also mention that the author knows of no other study that has shown this correlation.

1   Correlation Analysis Between the National Debt and the Free Trade Deficit

To perform this analysis, we provide the trade deficit data (for U.S. Trade in Goods and Services – BOP Basis)[2] from the U.S. Census.gov website. This is listed in Table 1 (also see Appendix A).

Column 2 in Table 1 provides the free trade deficit data in billions of dollars while Column 3 is converted to trillions of dollars. The columns (4 and 6) showing the cumulative results are provided to illustrate the running totals of the national debt and trade deficit since inception. The total trade deficit has accumulated to $7.51 trillion (since 1971, see Appendix B) while the national debt has now totaled to about $12.1 trillion for the end of 2009.

First we will look at the raw data in select years that make sense where we expect a correlation to occur. This will help to find the underlying relationship between the national debt and the free trade deficit. Selecting poorly correlated years distorts the relationship. Then the assumptions in providing select years are:

1) Select a reasonable sequential time period within the normal 20 year time frame of interest. We stated earlier that from 1990 to 1995, there was a minor trade deficit and there was little correlation. We also noted that 2008 and 2009 were highly irregular in government spending. These years will be ignored in the correlation analysis.
2) We provide two Trade Deficit Tax Consequence Models (TDC-models). TDC-Model 1 (M1 in Table 1) is a set of 11 logical years from 1996 to 2007 to look for a correlation. We will ignore one irregular data point of the year 2000. TDC-Model 2 (M2 in Table 1) is a worst-case scenario. We select a set of only 7 years from 1998 to 2006 and ignore 2 irregular years 2000 (true outlier) and 2001 (a partial outlier)**.**

There are of course other ways to analyze the complex data set in Table 1. We selected these data points and provide the above justifications to illustrate the correlation, the sensitivity of the data, and to find a first approximation range to the relationship between free trade deficit and the national debt.

Table 1 National Debt and Free Trade Deficit Data (1990-2009)[2]

Year	Annual Trade Deficit in Billions $	Annual Trade Deficit in Trillions $	Cumulative Trade Deficit in Trillions $	National Debt in Trillions $	Cumulative National Debt in Trillions $
1990	81	0.081	1.01	0.33	3.21
1991	31	0.031	1.04	0.39	3.6
1992	39	0.039	1.08	0.4	4
1993	70	0.070	1.15	0.35	4.35
1994	98	0.098	1.25	0.29	4.64
1995	96	0.096	1.35	0.28	4.92
1996	104	0.104 M1	1.45	0.26	5.18
1997	108	0.108 M1	1.56	0.19	5.37
1998	166	0.166 M1, M2	1.73	0.11	5.48
1999	265	0.265 M1, M2	1.99	0.12	5.6
2000	380	0.380	2.37	0.03**	5.63
2001	366	0.366 M1	2.74	0.14	5.77
2002	422	0.422 M1, M2	3.16	0.43	6.2
2003	495	0.495 M1, M2	3.65	0.56	6.76
2004	610	0.610 M1, M2	4.26	0.59	7.35
2005	715	0.715 M1, M2	4.98	0.56	7.91
2006	760	0.760 M1, M2	5.74	0.54	8.45
2007	701	0.701 M1	6.44	0.5	8.95
2008	696	0.696	7.14	1.04	9.99
2009	370 Est.*	0.37 Est.*	7.51 Est*	2.1 Est.*	12.1 Est.*

Next we provide two correlation graphs by plotting Column 3 versus Column 5 for the points we described. The result is provided in the Figure 1 and 2, respectively.

Figure 1 and 2 provide estimates of how well the national debt and trade deficit can correlate. This is obtained from the R^2 value of 0.711 and 0.794, respectively. The square root of each of these values is the correlation coefficient of 0.84 and 0.89 (R-value), indicating **an 84% to 89%** correlation, respectively out of 100% in these select time periods between 1996 to 2007. These correlations averaging 86.5%, indicate the underlying relation of the free trade deficit to mathematically correlate to our national debt.

[2] Trade Def. Ref. http://www.census.gov/foreign-trade/statistics/historical/gands.pdf,
National Debt Ref: www.whitehouse.gov/omb/budget/fy2010/assets/hist.pdf
*2009 Estimate from Jan to Oct. data.
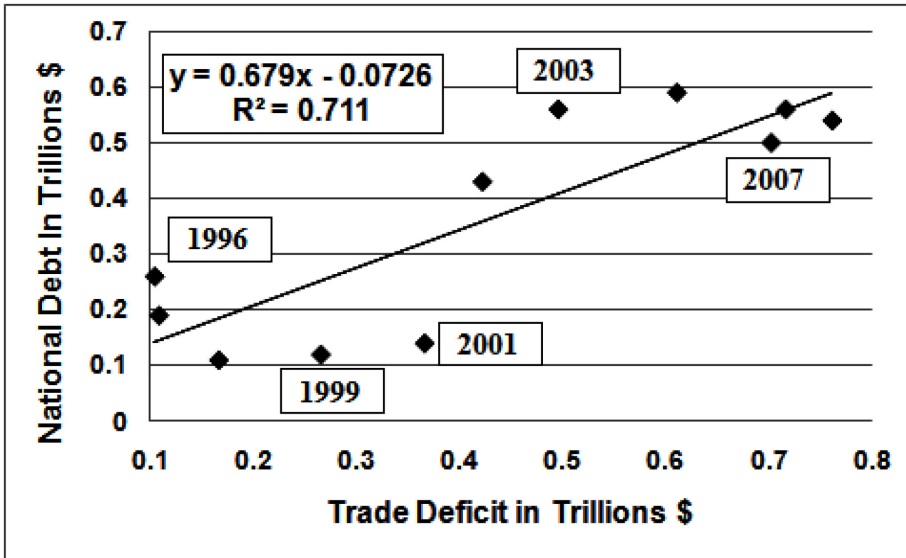** Outlier point - irregular data point

Figure 1 Model 1 of the national debt versus the trade deficit, 1996 to 2007 with outlier point 2000 removed (Column 3 vs. Column 5)
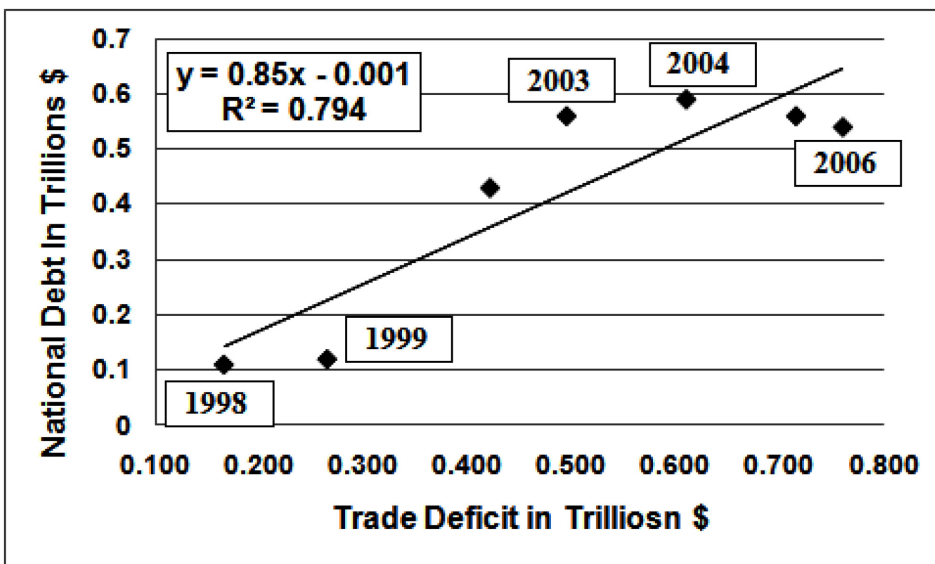

Figure 2 Model 2 of the National debt vs. the Trade Deficit (1998 to 2006, with outlier points 2000 and 2001 removed (Columns 3 vs. 5)

The actual dollar relationship is potentially challenging. To understand this, we note the slopes in Figure 1 and 2 are given by the X-Y relationship on the graph for TDC-Model 1 and 2 of $Y=0.679X - .0726$ and $Y=0.85X-0.001$, respectively. First we note that the Y intercept (.0726 and 0.001) are relatively small compared to the values in Column 3 from 1996-2009. We can take then the slopes as an approximate range. The upper range given by Y(National Debt) ~ 0.85 X(Trade Deficit) and a lower range of ~0.68 X(Trade Deficit).

The range implies that between 68 and 85 cents of every trade deficit dollar is mathematically linked in the TDC model to the national debt according to the math results and modeling assumptions. The correlation is reasonably strong in the select year showing statistical significance. We now assert a third assumption that:

3) this underlying mathematical relationship is valid for any time period of trade deficit.

Under this 3rd assumption we take the free trade deficit from 1971 (see Appendix B) to present day that has accumulated to $7.51 trillion (see Appendix A) and multiply it by 0.68 and 0.85. This yields a range from $5.1 to $6.38 trillion of trade deficit correlated to the national debt. The 2009 national debt is $12.1 trillion in Table 1, This implies from our TDC model that since 1971 under the above assumptions, the worst-case result is possibly as much as or a little more than half of America's national debt is found to be correlated to the U.S. free trade deficit.

Appendix A
Simple Examples of Tax Consequences Occurring from Different Types of Free Trade
In this appendix we provide some discussion on possible tax collection consequences from the U.S. trade deficit to help the reader understand the correlation observed in the data. Given the complex nature of the U.S. tax collection structure, we only site simple examples.

U.S. Import Related Tax Consequences:
1) Imports create decreases in federal tax revenues for various reasons, (such as products made by non U.S. citizens who do not pay federal tax compared to products or services that would have created tax revenues if the products were not imported. As well, foreign companies do not pay U.S. taxes compared to U.S. companies that would have paid taxes. Foreign owned U.S. companies may find tax advantages here.
2) Many U.S. CEOs outsource jobs creating service trade deficits, these "imported services decrease potential tax revenues of the company's workforce compared to non outsourcing. This also creates higher unemployment. Unemployment causes more lost tax dollars due to U.S. government subsidies. Profits of U.S. companies abroad may end up abroad decreasing potential tax revenues.
3) Foreign profits from the trade deficit that are reinvested typically do not provide the tax revenue that U.S. citizen reinvestments may provide. For example, currently foreign reinvestments are considerable in U.S. government obligation for the U.S. national debt and now total about $3 trillion. This provides tax liability as the U.S. has to pay interest on this money to foreigners. On the other hand, U.S. citizens pay taxes on many of their reinvestments when owning U.S. business and equities. Foreigners who reinvest in buying U.S. business also find ways to avoid U.S. taxes. Job outsourcing often occurs once a U.S. business is take over.

U.S. Export Related Tax Revenue:
4) Exports create federal tax revenue gains for various reasons (products more likely made by U.S. citizens who pay income tax, U.S. companies pay taxes on profits, we export services to foreign companies and these creates tax revenue through income tax, etc.)

The above information are basic examples, but they do serve to help in understanding the reasons for the correlation observed.

Appendix B
U.S. Trade in Goods and Services – Balance of Payments (BOP) Basis[2]
1960 to 2009

Period	Total In Millions of Dollars		Period	Total In Millions of Dollars
1960	3,508		1991	-31,135
1961	4,195		1992	-39,212
1962	3,370		1993	-70,311
1963	4,210		1994	-98,493
1964	6,022		1995	-96,384
1965	4,664		1996	-104,065
1966	2,939		1997	-108,273
1967	2,604		1998	-166,140
1968	250		1999	-265,090
1969	91		2000	-379,835
1970	2,254		2001	-365,505
1971	-1,302		2002	-421,601
1972	-5,443		2003	-495,035
1973	1,900		2004	-609,987
1974	-4,293		2005	-715,269
1975	12,404		2006	-760,359
1976	-6,082		2007	-701,423
1977	-27,246		2008	-695,937
1978	-29,763		2009	-370,000
1979	-24,565			
1980	-19,407			
1981	-16,172			
1982	-24,156			
1983	-57,767			
1984	-109,072			
1985	-121,880			
1986	-138,538			
1987	-151,684			
1988	-114,566			
1989	-93,141			
1990	-80,864			

Period	Totals
1960-2009	-7,471,584
1971-2009	-7,505,691
1990-2007	-5,508,981
1990-2009	-6,574,918

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