# Arthur Laffer's Stimulatingly Bad Math

By James D. Allbery, Jr.

I recently read an on-line Wall Street Journal article which claimed to show that stimulus programs do not work. It was an op ed piece written by Arthur Laffer (a noted economist who was an advisor to Ronald Reagan). You can read it at

http://online.wsj.com/article/SB10000872396390444873204577537244225685010.html .

I'm not an economist (I'm a software developer with a degree in math), and my only real interest in the article (and economics in general) is to understand things well enough to be an informed voter. Unfortunately, I found little enlightenment in Laffer's article. What I did find was enough questionable logic and math to stimulate me to do my own investigation into Laffer's analysis methods.

In his article, Laffer derides the Obama administration's assertion the additional stimulus will help spur economic recovery, saying, "that's an expensive leap of faith with no evidence to confirm it." Instead, Laffer claims that "spending was more like a valium for lethargic economies than a stimulant." In other words, Dr. Laffer is claiming that stimulus programs actual cause a reduction in Gross Domestic Product. As we will see, that's a big leap of faith, and Dr. Laffer's "evidence" does not really support his conclusion. I do not claim to understand economics well enough to debate economic theory, but I do know bad math and bad logic when I see it, and Dr. Laffer has done some pretty bad math.

Dr. Laffer presents a chart that lists 34 countries. For each country, he provides values for "Change in Government Spending as a % of GDP from 2007" and "Change in real GDP growth from 2006-2007 to 2008-2009." I have reproduced his table below:

**Government Spending Slows Growth**

Of the 34 Organization for Economic Cooperation and Development countries, those that 'stimulated' the most from 2007-2009 saw the least growth in subsequent GDP rates.

| Country | Change in Government Spending as a % of GDP from 2007 to 2009 | Change in real GDP growth from 2006-07 to 2008-09 | Country | Change in Government Spending as a % of GDP from 2007 to 2009 | Change in real GDP growth from 2006-07 to 2008-09 |
|---|---|---|---|---|---|
| United States | 7.3% | -8.4% | Belgium | 5.5% | -7.5% |
| Japan | 6.7% | -10.5% | Austria | 4.3% | -9.8% |
| Germany | 4.6% | -11.6% | Denmark | 7.1% | -11.6% |
| France | 4.1% | -7.7% | Chile | 5.2% | -8.9% |
| United Kingdom | 6.9% | -11.5% | Greece | 6.3% | -11.0% |
| Italy | 4.3% | -10.5% | Finland | 8.7% | -17.8% |
| Canada | 4.9% | -7.1% | Israel | -0.9% | -6.2% |
| Australia | 3.3% | -3.5% | Portugal | 5.6% | -6.7% |
| Spain | 6.9% | -10.4% | Ireland | 11.7% | -20.5% |
| Mexico | 5.2% | -13.5% | Czech Republic | 3.9% | -14.4% |
| Korea | 1.1% | -7.7% | New Zealand | 3.4% | -6.0% |
| Turkey | 4.4% | -15.7% | Hungary | 0.7% | -9.9% |
| Netherlands | 5.7% | -9.0% | Slovak Republic | 7.5% | -18.0% |
| Switzerland | -0.2% | -7.1% | Luxembourg | 6.8% | -16.2% |
| Sweden | 3.8% | -13.6% | Slovenia | 6.1% | -17.1% |
| Poland | 2.3% | -6.3% | Estonia | 12.8% | -35.5% |
| Norway | 6.2% | -6.7% | Iceland | 7.4% | -16.2% |

Source: International Monetary Fund

When I look at Dr. Laffer's table, I with my non-economist eyes, three things are almost immediately apparent to me:

1) 2009 was a bad year for the economy no matter where you were in the world. Of course, I was already aware of this, and would hope that Dr. Laffer, as a noted professional economist, would be, too.

2) Spending changes (as measured by Dr. Laffer) appear to be a really bad predictor of changes in GDP: even the countries that cut spending saw a decrease in GDP, and countries with relatively similar spending changes (e.g. Norway and Greece, or Australia and the Czech Republic) had wildly different changes in GDP growth. At the very least, the relationship between these variables is complicated.

3) Geographical and political seem to be a better

indicator of GDP performance than the spending changes: countries that have relatively close geographic and political ties (e.g. The United States and Canada, Slovenia and the Slovak Republic, Finland and Sweden) tend to show similar GDP performance.

However, Dr. Laffer apparently was not very interested in drawing any conclusions from the complete data table: he focused his analysis on only four countries. Now most scientists and mathematicians consider a large data set to be a good thing: the bigger your set of data, the better your chance for canceling out measurement errors and anomalous data. Then, analyzing the data, a scientist or mathematician might choose discard a few of the data pairs as anomalous if they clearly were outliers on what is otherwise a clearly mapped mathematical relationship. However, Dr. Laffer takes a startlingly different approach: he selects four of the least typical points (the four most "stimulated" countries, at least by his measure), and then uses these four most extreme points do draw a general conclusion. Any time someone begins their analysis by discarding 88% of their data, you have to question if their goal is objectivity.

So right from the start, Dr. Laffer's methods appear suspect. But let's take a deeper look at what he is really measuring.

While he does not describe his calculations, Laffer does identify his source as the IMF, and their data tables are readily available on the web. Their latest data makes it relatively easy to confirm that Dr. Laffer's "Change in Government Spending" column is simply the difference between the IMF's "Total Governnment Spending as a Percentage of GDP" values from 2009 and 2007.

Dr. Laffer's "Change in GDP" column proved a bit more challenging. My initial thought was that it would be that it would be the difference between the IMF's 2009 value for change in GDP (i.e., the change from 2008 to 2009 as a percentage of 2008 GDP: for simplicity, I'll call this $\Delta GDP_{2009}$) and the corresponding 2007 value (the change from 2006 to 2007 as a percentage of 2006 GDP). This (at least for the countries I checked) yielded numbers with smaller absolute values than Laffer's numbers. After additional investigation, I concluded that Laffer's calculation is actually:

$$(\Delta GDP_{2009} + \Delta GDP_{2008}) - (\Delta GDP_{2007} + \Delta GDP_{2006})$$

I do not understand why Laffer would think this is a useful way to measure GDP growth (or decline), but the above equation does yield results that are identical to Laffer's. Or Perhaps Laffer actually was comparing the change in changes between 2006 to 2008 with the change in changes between 2007 and 2009:

$$(\Delta GDP_{2009} - \Delta GDP_{2007}) - (\Delta GDP_{2008} - \Delta GDP_{2006})$$

Mathematically, these two equations are, of course, equivalent, but neither seems to me to be a particularly useful indicator of economic growth. Given that the net result of this equation is to compare two generally economically good years with two economically bad years, it is not surprising that every country in Laffer's table fares poorly.

Now the whole concept of adding and subtracting percentages derived from different divisors makes me a tad nervous (after all, if someone gives me 50% of one cookie and 25% of another, I cannot conclude that I have 75% of a cookie), so I decided to try to better understand what this equation actually means. If we expand the $\Delta GDP$ values to their source, we get

$$\left(\frac{GDP_{2009}-GDP_{2008}}{GDP_{2008}}+\frac{GDP_{2008}-GDP_{2007}}{GDP_{2007}}\right)-\left(\frac{GDP_{2007}-GDP_{2006}}{GDP_{2006}}+\frac{GDP_{2006}-GDP_{2005}}{GDP_{2005}}\right)$$

This simplifies to

$$\frac{GDP_{2009}}{GDP_{2008}}+\frac{GDP_{2008}}{GDP_{2007}}-\frac{GDP_{2007}}{GDP_{2006}}-\frac{GDP_{2006}}{GDP_{2005}}$$

Now remember, this is what Dr. Laffer asserts is the net result of any 2009 stimulus program. While I am confused how this really gives any indication of the result of a stimulus program, I am positively flummoxed how Laffer can contend there is a causal relationship between stimulus spending and the result of the above calculation when most of what happens in the calculation occurs before the alleged stimulus was implemented! In fact, given that most countries had shrinking GDPs in 2008, it appears to me that Laffer's method penalizes any potential growth in 2009 with shrinkage in 2008. It is almost as if Laffer's equation retroactively credits the 2008 economic downturn on looming specter of a 2009 stimulus program.

But outside of the questionable calculations and questionable time periods, there is another fundamental problem with the way Dr. Laffer has measured things. After all, he is looking for some linkage between these two measures:

$\frac{\text{Government Spending}}{GDP}$ and GDP.

Of course, that linkage ought to be obvious: the two are inversely proportional to each other. Dr. Laffer appears to have chosen to measure his data in a manner that bakes in the very type of relationship he was hoping to find (a linear correlation was unlikely given that the economies that cut spending shrank, too). In fact, it is interesting how poorly his data actually correlates, given that Dr. Laffer's approach to measuring the data is heavily biased to producing results that are consistent with his contention that economic stimulus programs are bad. Apparently the relationship between spending and growth is more complicated that Dr. Laffer would appear to want to admit.

There is also a conceptual problem here. Dr. Laffer is using changes in $\frac{\text{Government Spending}}{GDP}$ as a way of measuring the degree to which an economy was stimulated. However, you do not need stimulus programs to make $\frac{\text{Government Spending}}{GDP}$ increase: all you need is a decreasing GDP. If we hold spending constant, a negative delta in GDP will necessitate a positive delta in $\frac{\text{Government Spending}}{GDP}$.

If that were not enough, there are a number of additional problems with Laffer's analysis:

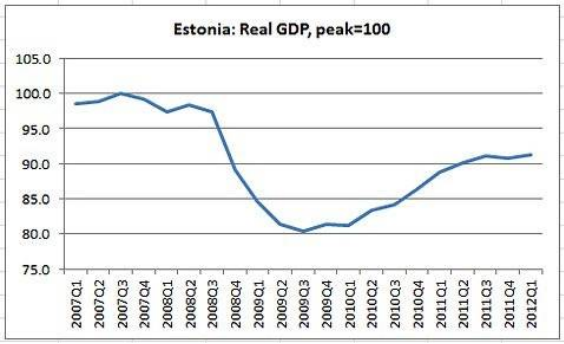
1. He equates <u>any</u> increase in the government spending relative to GDP with an economic stimulus. This is ludicrous. In a recession, a government's income decreases (as a result of GDP shrinkage), yet its short-term obligations (e.g., welfare programs) often increase (and Dr. Jaffer even notes this in his article). To suggest that these are the same type of stimulus programs that Dr. Laffer is arguing against is, at best, to conflate two different definitions of "stimulus." Besides, as described above, Laffer's calculations can yield supposed increases even when the government is reducing spending (as measured in real currency).
2. In an addition to simply assuming any increase is a stimulus, Laffer seems to assume that all stimuli are created equal. I suppose some Keynesian economists might agree with this, but isn't Dr. Laffer arguing against Keynesian economics?
3. Large, complex economic systems take time to respond to changes. One would expect a stimulus program to have some lag before it generates a noticeable uptick in the GDP. However, Dr. Laffer compares increased spending in 2009 with economic growth (or rather, the lack thereof) in 2009. That is not a fair measure of the impact of the spending. Expecting to see the full result of 2009 spending in 2009 is, at best, naive. Furthermore, comparing year to year numbers can be deceiving as well: a collapse in the last half of 2008 may have a more significant effect the total 2009 GDP than it does on the 2008 GDP.
4. Just like 2009 changes might not be seen until 2010, 2008 changes likely impacted 2009 performance. A serious, objective analysis would look more carefully at changes over time.
5. Even if some of the increased spending as a function of GDP was due to stimulus programs, we do not know what would have happened without these programs. Perhaps the resulting economic situation may well have been worse. Dr. Laffer ignores this possibility.
6. Laffer's data contains examples that disagree with his conclusions. He appears to conveniently ignore these data points, focusing instead, as mentioned above, on four atypical examples.
7. Each of Laffer's chosen four countries have economies that are less than 2% the size of the United States. Clearly it is a rather huge leap of faith to take a loose correlation made from the data of four small countries and use it as a base of setting economic policy for a country 50 times larger.

In short, Dr. Laffer started down a slippery slope when he decided to measure spending increases in a way that baked into his data the very relationship he wanted to find. He then proceeded to dubiously equate any spending increase with a stimulus program. Then he measured GDP growth in a way that minimizes any resulting uptick in growth, over-emphasizes the fact that economy was already in decline, and ignores other real factors that contributed to the overall economic state. In spite of all this, his data set actually does a pretty bad job of demonstrating the relationship he claims exists, so he cherry-picked four points that fit his desired conclusion.

But if that were not bad enough, he violated a cardinal sin of any sort of statistical analysis based on correlation: even a statistically significant correlation does not necessarily indicate causality. For example, if we looked into healthcare spending, we would find that patients with the highest cost of care also have the greatest chance of being seriously ill or dying. By the Laffer's logic, we must conclude that spending money on medical care kills people. This is, of course, ridiculous. It should be obvious

that people who are seriously ill are both more likely to spend money on medical care AND more likely to die. With that in mind, is it at all surprising that the governments making the biggest investments (particularly given Laffer's dubious approach to measure investment) are the countries with the most dire economic situation? I would say it is not surprising at all. And given that Laffer does not really allow time for the stimulus programs to work (if, indeed, his alleged increased spending is even a stimulus program), is it at all surprising that countries in dire economic situations have poorly performing economies? That is really all that Jaffer's chart says: The economy was bad in 2008-2009, and the countries with the worst performing economies had the worst economic performance.

Laffer's Estonia example is particularly interesting, and illustrates a number of the theoretical issues with Laffer's mathematical approach. If you look at quarterly data for the Estonian GDP, it is clear that GDP nosedived in 2008 and turned around in 2009 (eventually showing a modest uptick).




However, because of the steepness of the decline of 2008, the total 2009 value is still significantly lower than the total 2008 value. Because of the collapsing GDP, Laffer's skewed measuring approach makes it look like Estonia had a huge stimulus program that netted a huge fall in GDP. In reality, economically conservative Estonia did not implement a stimulus program, but, instead, cut spending. Laffer's stimulus is a myth, and a mere artifact of his bad math: a big dip in GDP caused the spending/GDP value to increase. And even if Estonia had implemented a stimulus program, the fall in GDP that Laffer attributes to a mythical 2009 stimulus program *actually occurred mostly in 2008*. Entertainingly enough, the above graph comes from an article that criticizes Keynesian economist Paul Klugman's assertion that Estonia's austerity programs are limiting its growth (see http://www.policymic.com/articles/9410/what-paul-krugman-gets-wrong-about-austerity-estonia-and-government-spending). If Laffer had not already thrown Estonia under his anti-stimulus bus, he might have been able to use the country as a positive example of fiscal conservatism. But I that would take some critical thought, careful analysis, and quality math.

Of course, Estonia is a small country with a small economy, and it seems pretty foolish (at least to me) to try to determine U.S. economic policy based on the performance of one small country facing a very different set of economic challenges (or for that matter, the performance of four small countries with a varied set of challenges). However, before we leave Dr. Laffer's data for good, is there anything we can learn from the largest economies from this list? Surely that ought to be a more useful comparison. Dr. Laffer conveniently lists them at the top of his table. I will reproduce them here:

| Country | Alleged Stimulus | Supposed Economic Impact |
|---|---|---|
| United States | 7.30% | -8.40% |
| Japan | 6.70% | -10.50% |
| Germany | 4.60% | -11.60% |
| France | 4.10% | -7.70% |
| United Kingdom | 6.90% | -11.50% |

Of the five largest world economies in his chart, the United States had the biggest "stimulus" by Dr. Laffer's flawed definition. Which of the five largest economies on this list best weathered the 2008-2009 economic storm? According to Dr. Laffer's data, the two large countries with best performance in the face of a global recession were the United States, and France (who was already outspending the rest on a per-capita basis). And this is in spite of the fact that Dr. Laffer (presumably inadvertently) chose a way to measure things that actually biases his data toward his pre-assumed conclusion. Since it is his data, I will leave it to Dr. Laffer to decide if this means that the U.S. should invest in a larger stimulus, or simply adopt France's standards for government spending per capita and/or spending as a function of GDP.

Of course, my suggestions for either additional and increased stimulus spending or adopting France's economic standards are in jest: they would be the antithesis of anything Dr. Laffer would want to do. The truth is that economic performance is governed by a huge number of variables and—quite frankly—is not really completely understood. If it were, there would not be so many divergent schools of economic thought. I am not about to claim I understand with any certainly the impact of government spending on the economy. Furthermore, I would never make a serious suggestion based on an analysis that omits more than three quarters of my source data and assumes that a questionable correlation indicates a causal relationship. Besides, I am not sure Dr. Laffer actually measured anything useful. But I'm not an economist with a political agenda: I'm just a guy who doesn't like bad math…