THE TELMARC GROUP, NOTES NO 46

IF ELEPHANTS HAD WINGS…OR HOW ECONOMISTS THINK, I THINK.[1]

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The MIT Campus is divided into two parts, the main Campus with all the Engineering, Science and Math, and even Liberal Arts stuff, and then the East Campus, the really East Campus, occupied by the Economics Department and Sloane. I always wondered why these two areas of academic study were so deliberately isolated. We in Engineering had an economics course from time to time but the mass of faculty in both areas were estranged from the rest of the campus.

The reason for this spatial Balkanization has become glaringly apparent in the past few months. Let me first start by giving a few examples from professions separate from economists and finance wizards.

First, if one were to go to a physician with say a furuncle, a large infected skin lesion, and the physician were to look at it, the physician would, based on science and experience, most likely lance the lesion, take some of the exudates for a culture to determine what if any bacteria is growing there, provide you with a broad spectrum antibiotic to ensure that you would not get sepsis and die of septic shock or a brain abscess, and then see you in a week to so to ensure that the lesion has healed properly. Such a course of action has taken place millions of times. There are articles in medical journals recounting how the results of various procedure fare and physicians are always testing themselves to find a better and more effective way to deal with such a problem.

Second, I want to build a bridge across a 400' river, and the north bank is solid granite and the south bank is sand and silt. The river is tidal and flows both east and west depending on the tide. There is a set of strong winds which may cause severe resonances of the structure. My engineer then uses both theoretical tools and field data to design the bridge and then proceeds to perform soils tests on both sides as well as evaluating specific seismic data. The engineer then builds a computer model of the structure and then performs simulations under various conditions. The simulations are based upon thousands of prior bridge designs and are all based upon real data.

Third, a lawyer is brought a possible case from an art dealer who has a belief that he has been defrauded. The lawyers look at all the evidence, and create a set of claims. Then he looks at the case law to see how such similar claims may have fared. If he finds claims that read on to his current case then he may be able to move quickly to a judgment. If he prevails in a jury trial then he must seek damages. There are many

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standard ways to determine damages, and he must then conform in his damage claim to those prescribed ways.

Furuncles, bridges, and lawsuits; three professions, disparate, but presenting a similar face. They are characterized as follows:

1. Facts: All deal with facts. Their models, their procedures, and their results are all based upon facts, prior tests, and experiments, cases, which build a body of knowledge, technology and technique.

2. Validation and Repeatability: The use of an antibiotic, subject to the proper care, and application of structural mechanics and the choice of materials, and the use of legal procedures and precedents all are validated by the tools of the profession, in that they effect the goal sought, and that they do so whenever applied to a similar situation, within reasonable limits. The action is definable and the result measurable and it works the same every time.

3. Actions and Results: All three have the action-result characteristic. The professional takes a specific demonstrable and measurable and repeatable action and such an action ends in a result which is generally, not necessarily always, repeatable. These people live in a Bayesian world, namely it is still probabilistic, but the result is highly conditioned on the action.

4. Basis: In all of these professions there is a basis, a rationale based upon demonstrable, proven, repeatable, and accepted evidence, that the problem is what it is and the solutions works in addressing the specific problem. Basis is a critical element in any of these professions.

5. Accountability: The physician, engineer and lawyer can be sued for making a representation or taking an action which results in harm, is deficient in professional standards and duties, or in some other way is actionable. No one has ever sued an economist for a prognostication. Even finance people get sued, but not eh economist. They seem to be a protected class.

Now back to the MIT Campus. Engineers and Scientists deal in a world as outlined above. Frankly it is the world that all business works in; actions and results and, rewards and punishments. Economists, especially macroeconomists, do not live in that world. Ask anyone what is the cause of the current economic crisis and one may receive three to ten answers, none consistent and none coherent. Then ask what should be done, and it gets worse, all too frequently it is to just spend more money. It would be akin to going to a physician and presenting with some ailment and then being told it could be any one of several ailments and that the patient could be bled several hundred times. There is no basis for doing so,

Thus I now surmise why the separation between the two factions both exists and has prospered. The engineer when taking a course in macroeconomics would ask; where did that come from, what was the basis in reality for that assumption, how much of a

budget surplus do we get, how long will it take to change. Macroeconomists cannot tell.

But in the current economic times the macroeconomist is moving to the helm of our economy. Deficit spending, large Government spending programs in infrastructure and the like are all the fashion. The concern is that these very macroeconomic actions may have no basis in any reality and moreover they may actually result in a long term collapse of the true strength of the American economy, the entrepreneur. We argue in this paper that these programs, especially those advocating competitive infrastructures like power and communications will create Space Program drains on our economy and repeat the temporary defeat of the US to Japan in the 70s and 80s into a much greater defeat of the US to China in the 2010s and 2020s. In the Kennedy era we invested in defense and more so in the Space Program and that investment took the best brains out of the nascent entrepreneurial environment and sent them into the Government troughs. The result was Japan building a great manufacturing and product base and the US economy stalling for twenty years. We argue herein that the same may happen if the new Administration listens to the macroeconomists.

Ways of Counting

Counting, measuring, and acting on the data can be effected in many ways. These are schools of thought or even world views. They are built upon the paradigms each school brings to the table to address the problems it is seeking to solve. There are four schools of thought, world views, or ways of dealing with financial problems, numbers, and solutions. Simply stated they are:

1. The Accounting Method: Accounting has an historical mindset. The accountant acts like an archeologist. The accountant takes what has occurred, looking backward, and places the data into well defined cubby-holes characterized by assets, liabilities, revenue, expenses, and the like. Accountants are basically paleontologists, taking the fragments of the past and arranging them in a pre-ordained manner subject to certain rules with a minimum of discretion allowed. The accountant then tells a history using a limited set of paradigms. That is why one would never hire an accountant to be a CFO. CFOs must be looking forward, understanding where the company is going and anticipating success or perdition. Accountants look forward only until the last quarter. A Budget is an accountant's view of the future. One takes the past, all of the categories that the past brings with it, and then one goes from the bottom up and inserts how many people, salaries, travel and the like needed to perform the task going forward. The classic Budget is mired in the past and also is a slave to the organization that was present in the past. The Budget never truly asks the question of what needs to be done in generating revenue, of competing or of improving cash flow. It takes the well defined cubby holes and fills them with what each group feels it needs going forward. That is why managers during hard times "cut the Budget" by say 10% across the board rather than re-organizing to meet the tasks at hand.

2. The Microeconomist: The microeconomist is hampered by two failings. First they tend to look at the specific industry as a whole and second they are encumbered in their visions with a mindset steeped in the heavy capital intensive manufacturing

paradigm of early 20th century United States. The analytical tools are those developed in the world of large steel manufacturing plants, not in the operations of highly distributed telecommunications systems. The assets in the world of the microeconomist all too often has the lifetime of human and in reality the lifetime of a capital asset in the new electronic world may be but a few years. Thus methods to determine economies of scale and the like require structures devoid of the highly volatile elements which go into the deployment of capital plant.

3. The Macroeconomist: The macroeconomist if truly in a world of their own. They are the ultimate in the "top down" view of the world. The macroeconomist looks at the world as a simple set of equalities. They start with the general terms of gross national product or aggregate income.

$$GNP = C + I + G + (X - M)$$

$$C = consumption$$

$$I = plant \,\&\, equipment$$

$$G = Government$$

$$X = exports$$

$$M = imports$$

Also

$$GNP = C + S + T + R$$

$$C = consumption$$

$$S = savings$$

$$T = tax$$

$$R = transfers\ to\ foreigners$$

The macroeconomist then develops models, ever so more complex, for each of the elements in the above tautologies. Money is at first fixed, then made dependent on sets of variables with more and more complex a set of models, based at best loosely on reality.

If one asks a macroeconomist what the solution to the current problem is, all one gets is increased Government spending. How much spending, like how much erythromycin, and you never get an answer. It is like having your physician say take this drug, not telling you how much or how often or when. Or like having the engineer say the beams must be strong, not what they should be made of, how thick, how long, or the like. Or the lawyer saying you should just win the case, not giving you any precedents or providing any basis in fact for your claims. No other profession in the world has such a clueless work ethic. Even religion at least has a Bible, a set of rules, sometimes open to conjecture, but there are rule books. The Mafia even has a code. Macroeconomists do not!

The macroeconomist used graphs, linear graphs, which if they are even slightly correct fail to include the nonlinearities and feedback elements which lead to instabilities. Secondly the microeconomist deals with differentials and ratios of differentials, with hand waving statements regarding their positivity or negativity. There are volumes of these differentials and their ratios, oftentimes reduced again to the linear curves. Missing of course are values for exes and validation based upon past data.

The macroeconomist is the one who says that "if elephants had wings they could fly". The pachyderm does not have wings, and even if it did the wings it may have most likely not support flight.

4. The Functional Business Modeling: This approach to addressing the financial planning and management problem is to start with revenue, as one would do in a business, and determine what is necessary to generate and support the revenue. Also this is done looking at three factors, (i) revenue drivers, (ii) productivity factors, and (iii) unit costs. Thus one would look at say a customer services support group and determinant eh driver as the number of customers, the productivity factor the calls per customer per month and the unit costs the wage rate of each customer services employee. One can reduce these costs while keeping the revenue by decreasing the calls per customer and/or paying less in wages. Unfortunately there is often a tradeoff; lower wages results in more costs, the peril of outsourcing! The advantages of this way of thinking is that it achieves the following: (i) is focuses on the goal, in the business case revenue, (ii) it includes all functions necessary to meet the goal, in this case customer services, (iii) it provides performance measures or metrics based on actual data and also allows for understanding optimization or measuring slack, (iv) it can then be used as the construct of a budget so that reality cane blend seamlessly with the model, and if necessary adjust to reflect what reality truly is.

The economy will be controlled by Neo-Keynesians in the new Administration. Summers and Bernanke are in many ways quintessential examples. Paulson is not. Paulson, like Rubin before him, was an investment banker, one attuned to making deals, taking the fee, and walking away. Frankly the current TARP actions by Treasury are those of an investment banker not an economist.

OBSERVATIONS

There are several intriguing conclusions and observations:

1. The model of an economy is no longer a model based upon a single country. All too often we do not add in the trade issues but it may have expanded much more than just trade. The economic infrastructure is much more expansive and thus a stimulus may have to be global and not just country by country.

2. The elements of the relationships are posited to reflect what may appear to be the cased and not predicated on experimentally validatable and validated facts. There are many examples of the macroeconomists models which are developed in an attempt to show how certain phenomenon work. The typical examples are the Classical, monetarist and Keynesian models for the impact of money. The business cycle model

starting with Samuelson in the late 30s, going forward with the growth model of Solow and then the anti-monetarist models of Temin describing the cause of the Depression, are examples of the analysis typical in macroeconomics. They all see a set of facts and then create a mathematical model that gives a result those sort-of gives results similar to some of the facts. The growth model is nothing that a second order differential equation whose constants are selectable to model cyclic behavior. But an engineer would take the laws of motion or Maxwell's equations, all based on facts, and determine from them the model and from that validate it. The macroeconomists just posits it and moves on. There is no set of fundamental physical laws. The same is true for consumer supply and demand, for models in the state of flux and the like.

3. Dynamics of the models must be more effectively stated: Things change and nothing is ever constant. The classic corn-hog cycle is an example of equilibrium never truly being attained, it is always cycling. The recent work in the macroeconomics area, such as the dynamic general equilibrium approach[2],

4. Random effects and uncertainties must be modeled: Random effects are of two types; first the truly random events from those in the small to those in the large, the black swan events. The second type of random events are those we call random because we just do not know enough at this time to model them, thus we say their effect are noise when in truth they are things that have form and structure bit we have not seen what they are.

5. The dynamics of human responses, sometime called behavioral economics, must be more assertively included. Equilibrium just does not exist in any economic model. People always change and the behavioral change is the most critical.

6. Data must be more readily available from Government Sources and done so in a consistent and more frequent manner. To obtain data from Government sources is like pulling hen's teeth. One relies on Google and then searches. The Government should centralize the data and make it general accessible in formats readily usable. The Treasury is a wasteland and there are so many Agencies and Departments that an aggregator role is essential.

Impact on High Tech Investment

The impact of all of this economic upheaval on the entrepreneur will be dramatic. There is a malignant attitude that the entrepreneur is now dead and that the economy and the taxpayers must rally to support the old infrastructure. Thus, the efforts to throw billions wantonly into the near defunct auto makers is another example. We would argue that the same is true in those attempting to push similar billions into Government funded broadband infrastructure. The unions are key drivers on both, the United Auto Workers and the Communications Workers of America. Union efforts are

[2] See Wickens, M, Macroeconomic Theory, Princeton 2008, is an example of the recent literature trying to incorporate some form of dynamics. However it still lacks any semblance of scientific ort engineering methodology being based upon facts and reproducible and verifiable by experiment.

aggressively driving money into their pockets and that money will find little movement into the entrepreneurial space.

The recent meeting of "A Call to Action for a National Broadband Strategy" is a most recent example. Signatories as of December 1, 2008 had a plethora of signatories.[3] They proposed the following:

"The framework for our National Broadband Strategy includes the following:

- ***Goals**. The National Broadband Strategy should set out several clear, forward-looking, and attainable goals that take into account the ability of broadband to generate huge benefits in education, environmental protection, scientific research, medicine, health care, energy efficiency, transportation, and overall economic vitality. These goals should include the following:*

a. Every American home, business, and public and private institution should have access to affordable high-speed broadband connections to the Internet.
b. Access to the Internet should, to the maximum feasible extent, be open to all users, service providers, content providers, and application providers.
c. Network operators must have the right to manage their networks responsibly, pursuant to clear and workable guidelines and standards.
d. The Internet and broadband marketplace should be as competitive as reasonably possible.
e. U.S. broadband networks should provide Americans with the network performance, capacity, and connections they need to compete successfully in the global marketplace.

- ***Policies to Stimulate High-Speed Broadband Investment**. The federal government, in collaboration with state and local governments and the private sector, should play an active role in stimulating broadband deployment, particularly in un-served areas. Such support might include tax incentives, grants, low cost loans, loan guarantees, universal service subsidies, efficient use of spectrum, and other approaches.*

- ***Policies to Stimulate High-Speed Broadband Adoption and Use**. The federal government, in collaboration with state and local governments and the private sector, must play an active role in stimulating adoption and use of advanced broadband connections. All Americans must have access to computers and the knowledge to use broadband technology effectively. Federal support might include programs, grants, subsidies, and other measures that foster broadband connectivity, computer access, education, and training.*

- ***Assessment and Accountability**. Specific timetables and benchmarks should be established to help encourage successful implementation and advancement of national broadband policies, incentives or programs. A system for regular and timely collection and publication of data concerning the deployment, adoption, and use of high-speed*

[3] See http://bb4us.net/id8.html

broadband should also be instituted to ensure that our national goals and timetables are being met."

This gathering has received some criticism as well.[4] Sanchez has stated:

"As the sluice gates of stimulus open, proponents of expanded broadband access are hoping the Net will catch some of the cash Congress is preparing to pump into the economy. An impressive array of telecoms, trade associations, tech companies, think tanks, and advocacy groups have issued a "Call to Action," introduced at an event on Capitol Hill today, urging the incoming Obama administration and the 111th Congress to make implementation of a comprehensive national broadband strategy a high priority.

The coalition of signatories behind the Call to Action brings together a number of heavy hitters often found aiming their punches at one another: AT&T, Verizon, and the Telecommunications Industry Association dancing cheek-to-cheek with Google, Public Knowledge, and Free Press. This kumbayah moment was midwifed by attorney James Baller, who explained the strange bedfellows' manifesto at Wednesday's launch event."

Richard Whitt, the Google in house lobbyist wrote in his blog[5]:

"We need a national broadband strategy to reverse this trend. High-speed Internet access will generate enormous economic and other benefits for all Americans. As the Call to Action puts it, the broadband-enabled Internet has become "a catalyst for innovation, economic growth, job creation, educational opportunity and global competitiveness."

To me, three key pieces are necessary to fully support an open and generative Internet. First, we need more competitive, ubiquitous, and mobile pipes, at faster speeds, and with greater uptake by consumers. Second, we need enough raw capacity available on those pipes to support robust Internet access. And third, we need open, neutral on-ramps to the Net itself. Importantly, all three elements are outlined in today's Call for Action. When you add in the impressive breadth and depth of the coalition membership, we may finally be on the road to adoption of a real national broadband strategy."

The question is what do these people mean by a Strategy? Is the Strategy a Government Policy, is that what they mean. Is it what Baller and associates seem to imply as a grab at the billions of taxpayer liabilities to fund friendly municipal networks? Is this the TVA of the 21st Century? Is this another move to stimulate the economy? Is this macroeconomics run amok?

[4] See http://arstechnica.com/news.ars/post/20081202-telecoms-and-advocacy-groups-issue-joint-call-to-action-on-broadband-policy.html

[5] See http://googlepublicpolicy.blogspot.com/2008/12/national-broadband-strategy-now.html

So will this Broadband Strategy fill the economic slump? Since we argue that macroeconomists really have no idea what they are talking about, and since just spending money to ensure the entrenched incumbents appears to be part and parcel of the strategy, and since the unions are also essential to this strategy in terms of its acceptance, then this government funding will just suck the air out of entrepreneurial opportunities and will set the US back generations.

We have argued elsewhere that the Space Program of the Kennedy Administration, combined with the spending in the Vietnam War, set the US economy up for its twenty year beating at the hands of the Japanese. While the US sent its best brains either to war or into the space-defense business, building satellites, space stations, aircraft, radars and bombs, the Japanese developed the tools and techniques that did them well for the next twenty years. It was only in the early 1990s after the fall of the Japanese markets in their real estate bubble that we had a chance, through the entrepreneurial initiatives, to come back up. The proposed institutional spending and "investments" would create another sucking Space Program, dragging resources into the infrastructure which should be built in a competitive environment based upon returns on investment not on the religious belief that anyone living on a Mountain top in West Virginia has the right to the best broadband in the world[6]!

But in his speech of December 6, 2008 Obama promoted a program for massive infrastructure build out including both broadband and healthcare infrastructure. The New York Times states[7]:

"Mr. Obama's plan, if enacted, would be in part a government-directed industrial policy, with lawmakers and administration officials picking winners and losers among private projects and raining large amounts of taxpayer money on them.

It would cover a range of programs to expand broadband Internet access, to make government buildings more energy efficient, to improve information technology at hospitals and doctors' offices, and to upgrade computers in schools.

"It is unacceptable that the United States ranks 15th in the world in broadband adoption," Mr. Obama said. "Here, in the country that invented the Internet, every child should have the chance to get online."

President Bush and many conservative economists have opposed such large-scale government intervention in the economy because it supports enterprises that might not survive in a free market. That is the crux of the argument against a government bailout of the auto industry."

[6] It must be noted that my daughter and grand children live in West Virginia and I like West Virginia a great deal. However whether it is West Virginia or New Hampshire or even New York, I do not believe that broadband is any right.

[7] See http://www.nytimes.com/2008/12/07/us/politics/07radio.html?scp=5&sq=obama%20infrastructure&st=cse

It is clear that the Obama Administration desires to have the Federal Government, under the aegis of the policy makers and their macroeconomist fellow travelers, establish industrial policy and control in the Office of the Executive. That is what the Soviet Union did to their detriment. Our economy is driven by entrepreneurial give and take, by Schumpeter's creative destruction, not by any well planned economy. After centuries that should be obvious to anyone who has ever had to pay another's salary, namely those who create wealth, not just transfer wealth.

WHY BROADBAND IS A BAD INFRASTRUCTURE PROJECT

There are many broadband providers out in the market today. The reasons for the US position are less a problem of the US than a problem of how one looks at the data. The problem with the US directly investing in broadband is less a problem of money flow than one of pushing aside entrepreneurs.

Rank	Broadband subscribers, total, June 2008[8]	
1	United States	75,009,521
2	Japan	29,341,909
3	Germany	21,618,300
4	United Kingdom	16,710,169
5	France	16,700,000
6	Korea	15,059,029
7	Italy	10,727,651
8	Canada	9,201,998
9	Spain	8,738,793
10	Netherlands	5,806,595
11	Turkey	5,012,999
12	Australia	4,981,656
13	Mexico	4,980,184
14	Poland	3,650,000
15	Sweden	2,933,014
16	Belgium	2,789,579
17	Switzerland	2,471,592
18	Denmark	1,996,408
19	Austria	1,704,769
20	Czech Republic	1,626,000
21	Finland	1,616,200
22	Hungary	1,583,102
23	Portugal	1,568,247
24	Norway	1,554,993
25	Greece	1,245,974
26	New Zealand	853,020
27	Ireland	832,590
28	Slovak Republic	480,375
29	Luxembourg	133,736
30	Iceland	98,361

The following Table depicts the rankings performed in June 2008 by the OECD. One must read them carefully to understand their meaning. The OECD ranks the US 15th in broadband penetration. OECD ranks: Denmark, Netherlands, Norway, Switzerland, Iceland, Sweden, Korea, Finland, Luxembourg, Canada, United Kingdom, Belgium, France, and Germany ahead of the US. However having been in each of these countries at length and having had one of my subsidiaries in many if not most of these countries over the years, there is an observation that should be made. Take Canada, as

[8] See http://www.oecd.org/document/54/0,3343,en_2649_34225_38690102_1_1_1_1,00.html

an example, since more than 90% of its population lives within fifty miles of the US border in a strip some three thousand miles long.

Not truly comparable to the US. Luxemburg is akin to Greenwich, CT, frankly is at best a post office with a castle and a few banks. Iceland is three cities and vacant land in between. Korea, one need only look at Seoul, it is a mass of high density newly built multiple dwelling units. Rural penetration in Korea is de minimis since there is little population in the southern mountain regions and then in Pusan the population grows. Sweden, Finland, Denmark, Netherlands, and Norway are all densely populated and Sweden, Finland and Norway have northern regions akin to most of Canada which is unpopulated.

The United States is a massive country compared to all of the top countries on the list. In addition the true statistic should be connection per household not per person. In the US the study alleges that there are 25 broadband connections per person. But there are almost 4 persons per HH. Thus there are according to this study there are 100 broadband connections per 100 HH! In the US there are about 80 million HH and there is 80% cable penetration with 50% take-rate of cable modems. Thus there are 32 million HH with cable modems or a cable modem access.[9]

In many of the other countries there are fewer people per HH. In other there is more. Thus the true metric should be HH not per person or inhabitant. In fact if one looks at the total broadband subscribers in the US as 75 million people, then we see this as about 20 million HH. This is a 25% penetration. In the US a person does not get a connection a household does!

[9] See http://www.vnunet.com/vnunet/news/2214380/broadband-penetration-jumps-300 which states an April 2008 study saying that cable penetration of broadband is now 49%.

Rank	Country	DSL	Cable	Fiber/LAN	Other	Total
1	Denmark	22.5	9.8	3.2	1.1	36.7
2	Netherlands	21.2	13.7	0.4	0.2	35.5
3	Norway	24.1	5.9	2.6	0.7	33.4
4	Switzerland	22.5	9.7	0.3	0.3	32.7
5	Iceland	31.2	0.0	0.5	0.6	32.3
6	Sweden	19.9	6.4	6.0	0.1	32.3
7	Korea	8.4	10.5	12.2	0.0	31.2
8	Finland	26.1	4.0	0.0	0.5	30.7
9	Luxembourg	24.8	3.4	0.1	0.1	28.3
10	Canada	12.6	14.9	0.0	0.4	27.9
11	United Kingdom	21.7	5.9	0.0	0.1	27.6
12	Belgium	15.8	10.4	0.0	0.2	26.4
13	France	25.1	1.3	0.0	0.0	26.4
14	Germany	24.6	1.6	0.0	0.1	26.2
15	***United States***	***10.1***	***13.2***	***0.9***	***0.8***	***25.0***
16	Australia	18.6	4.2	0.0	0.8	23.5
17	Japan	9.6	3.1	10.2	0.0	23.0
18	Austria	12.9	7.1	0.1	0.5	20.6
19	New Zealand	18.2	1.2	0.0	0.9	20.4
20	Spain	15.5	3.9	0.1	0.3	19.8
21	Ireland	14.0	2.1	0.1	2.8	19.1
22	Italy	17.6	0.0	0.5	0.2	18.2
23	Czech Republic	6.3	3.4	0.6	5.5	15.8
24	Hungary	7.8	6.5	0.0	1.3	15.7
25	Portugal	8.6	6.0	0.0	0.2	14.8
26	Greece	11.2	0.0	0.0	0.0	11.2
27	Poland	6.7	2.7	0.0	0.1	9.6
28	Slovak Republic	6.0	1.0	1.6	0.3	8.9
29	Turkey	6.7	0.1	0.0	0.0	6.8
30	Mexico	3.1	1.4	0.0	0.2	4.7
	OECD	12.8	6.1	1.9	0.4	21.3

Notwithstanding the confusing data that the Obama Administration seems to be relying upon, one need only ask what does this cost per household, or resident[10]. We have detailed this analysis multiple times in the past. The analysis is a two step process:

1. The backbone network requires passing residences. That costs typically between $40,000 and $80,000 per mile. The simple question then is how many HH per mile. In rural areas there may be as few at 2 to 4 HH per mile. Then this means anywhere between $40,000 per HH down to $5,000 per HH just for access to a cable on the pole somewhere.

2. Then is the connection to the HH itself. That has a fixed equipment consists of about $500 and a variable cost of about $5 per foot from the network covering the town backbone. If a farm home is 500 feet from the street then we need an additional $2,500 plus $500, or $3,000 per HH.

3. There is another minor point, namely connecting to the internet backbone via a Tier 1 carrier, such as Level 3. How does one get from say Colebrook, NH or Weston, WV to the backbone? That may require a 50 mile or more fiber run on rural highways. This

[10] There are many who attempt to defend the OECD data, see http://www.itif.org/files/NextGenerationBroadband.pdf it is interesting in that the defense is performed using only snippets of the data so as not to reveal its problems. The data for example clearly excludes all wireless connections, using open WiFi or cellular networks, all of which are clearly broadband.

can cost another $25,000 per mile at best for say 40 miles, and this adds another fixed amount of $1 million per small town.

4. Finally, who operates this? This is not electricity. It is not a TVA where one just runs wires and puts a plug in ands connects a light bulb. It is complicated electronics and the like, and it fails from time to time. This is a serious question. Are we to create a TVA like national rural authority and make these all Federal jobs? Are small towns to manage this, with what competence? Small towns have all too much difficulty managing local school budgets; one expects these people unskilled in the complexity of this to perform this task. We believed it was possible six years ago but after a great deal of exposure we feel it is highly unlikely, it require dedicated professionals who respond to the market[11].

The issues regarding broadband are I believe simple:

1. There are small cadres of people in rural areas who want broadband but have limited if any access. They live on the fringes of civilization and on the one hand want that isolation from humanity but on the other-hand believe they have a right to a select set of what urban and suburban citizens have, yet at costs equal to those who live in the more densely populated areas. They effectively want the people who live in the more dense areas to subsidize their access and their selected life style. I believe that this is called a "transfer of wealth", albeit from those in urban and suburban markets that may not be too wealthy!

2. There is a large cadre of companies, including Google, who apparently see this as an entrée to establishing their desired Internet Neutrality world via a back door. It is not clear what this means since the small local networks are such a tiny part of the market.

3. Macroeconomists, whose strategy is dropping dollars from helicopters, seem to just view the broadband project and just that, a way to drop dollars to the hinter lands. Perhaps dropping dollars elsewhere would be better, or even not dropping dollars would be the best.

Principles and Recommendations

There are several specific recommendations we can make, extreme as they may be. They all address the goal of growth and expansion.

The following are the basic assumptions we need to make to move to the recommendations:

[11] Also there is the issue of pricing. Generally as a rule of thumb for such an infrastructure project, including expenses, the monthly fee should be between 0.5% and 1% per month of the invested CAPEX. Thus if we look at rural broadband and we assume that we are not just doing one-of mountain tops, based on our many studies of towns and locations we estimate a CAPEX per installed subscriber of $8,000. Using 0.7% per month as a lower end target this means $56 per month just for broadband, video is in addition. This is the best one can achieve since the dominant element of CAPEX is really labor. Unless there is a massive depression with concomitant deflation, this cannot not be changed. See www.telmarc.com for many designs on such systems as well as business plans.

1. **The Global Economy now Demands a Global Approach to Solutions**: Many of the problems that we face oscillate now through a global economy, one of our own creations. The old macroeconomics stated that we can neglect foreign trade and look at ourselves as a closed economy and take actions accordingly. Clearly this is no longer the case. There are feedback elements that will set this system on unwieldy swings if we failed to try and balance these interests. China's role as our largest creditor is just one example. They send money back to us which we have sent to them. There is a great cycle here that is unseen in many of the current macroeconomic models.

2. **Entrepreneurs Generate New Wealth**: The all too often told story that a large percentage of the top companies of fifty and a hundred years ago are no longer in existence and that they have been replaced by companies founded by entrepreneurs is the basis of the American economy. The truth is that entrepreneurs do generate all the new wealth in the economy. The Obama Administration seems to be taking the position that the Government can create and staff new "business" entities and choose technological winners and methods. We know all too well that the Government should not be in that role. The FCC has all too often used its power swinging back and forth on this issue, HDTV being a prime example.

3. **Governments have a Role and Duty to Regulate the Integrity of the Money Markets Within and Across Borders**: The flow of investment money in the entire food chain of the economic world in a reliable and somewhat predictable manner is key. The use of the financial system as a craps table in Vegas works against that goal. Government should ensure that gambling with our economy is not taken to extremes. 30 or 40 to 1 debt ratios are insane, zero down payment mortgages make no financial sense, debt without due diligence is effectively criminal. The Government and Governments in general should establish standards to bound the limits of the financial world, not to delimit it but to insure that it does not get out of control. As we have stated before, the natural tendency of the Wall Street types is to push the edge of the envelope, to go where no one has gone before, and in so doing to take risks that are possibly unbounded.

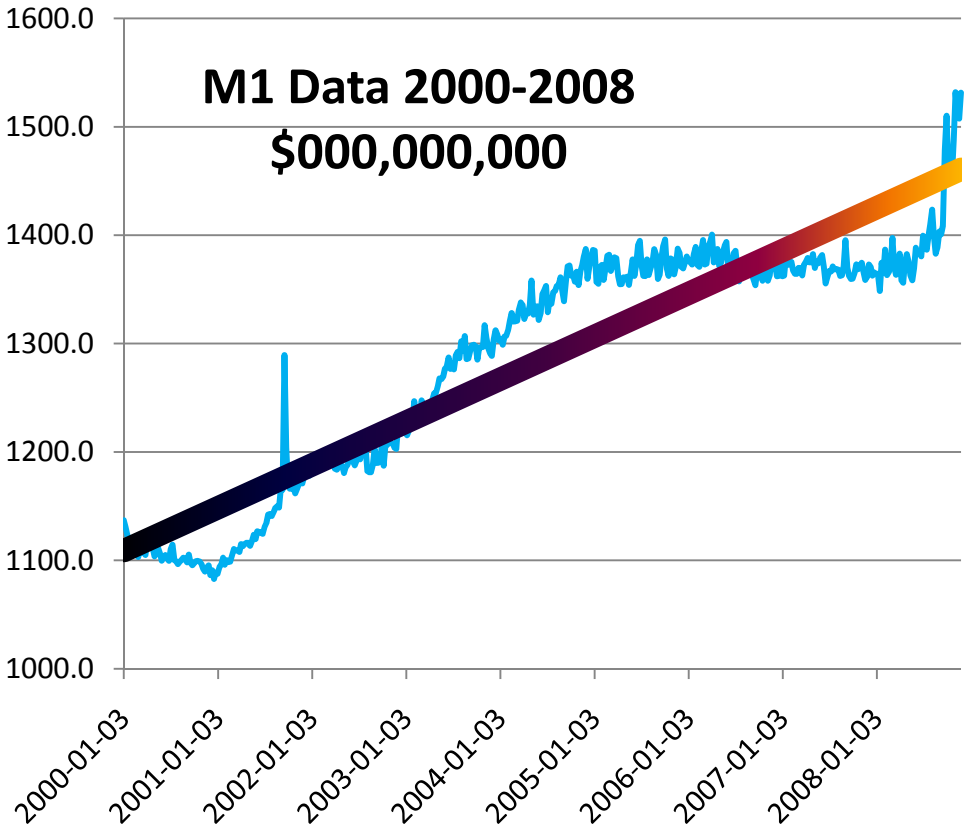
4. **Creative Destruction is now more Than Ever a Viable Construct**: There are times when institutions which have failed to adapt should be allowed to fail and then reinvent themselves. Newspapers, Auto Manufacturers, Investment Banks, and others should be allowed to go through the process. From this would come better institutions? However there are certain institutions, if properly compartmentalized, such as commercial and retail banks, should have a steady road, their failure results in destruction of elements that will potentially collapse the economy. Thus Glass Stegall was a god act and its elimination by Gramm and others was wrong. The connected Investment banks and commercial banks, we already knew where that would go.

5. **The Proposed Obama Administration Broadband Policy, whatever it may evolve to be, has the risks of just spending**

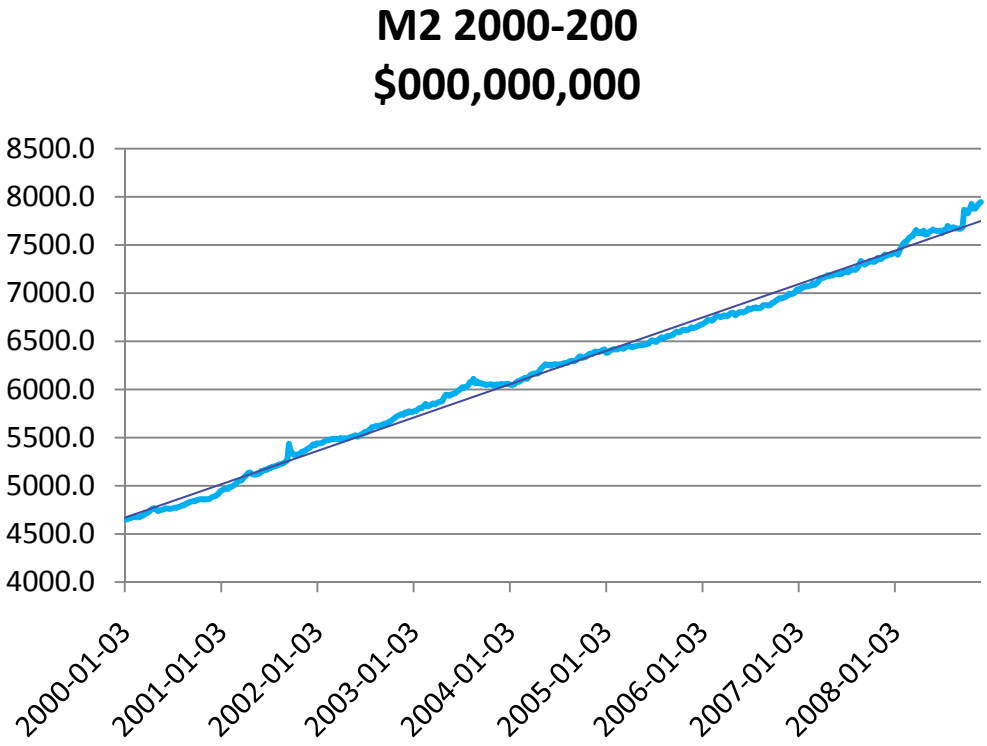
MONEY RECKLESSLY AND CREATING FEW JOBS. These few jobs will most likely not be created where they should be created and benefitting a small portion of our society who have made life style choices that have inherently precluded them from benefits that accrue to those who pay for them in urban and suburban markets. There is no right to broadband, especially at the cost that it will require. There is no long term benefit from broadband to rural areas. This is not a highway project, opening new markets. In fact it may very well have the opposite effect, further isolating people in rural areas and thus further setting the bar for more and better services at higher and ever increasing marginal costs to be paid by the mass of taxpayers already paying the bills!

6. **THE MACROECONOMIST APPROACHES OF THROWING MONEY AT THE SOLUTION AND THE BUSH AND OBAMA ADMINISTRATION APPROACH OF EFFECTIVELY NATIONALIZING INDUSTRIES** [12]**.** This will lead to catastrophic results. From a monetarist viewpoint, looking at M1, we see it has been held flat from early 2004 thru most of 2008. Only recently has the FED expanded it.

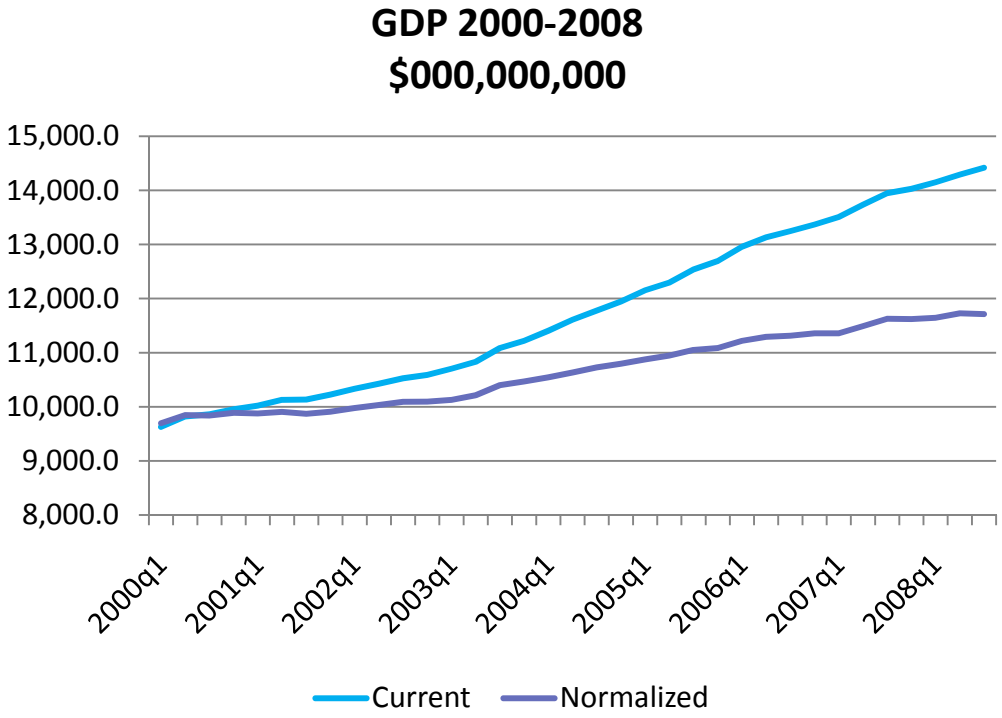
[12] See http://www.salon.com/opinion/feature/2008/12/09/obama_bonds/print.html This article is amazing in that what it is effectively proposing is that the Federal Government issue bonds so that it can finance these new infrastructure projects. This has two immediate effects. First it takes away from the States what they normally would do in the roads and infrastructure area and creates a nationalized construction organization. Second it creates for projects like broadband, energy, autos, a means and method to make them government entities and to have bonds related directly to each of these entities. It takes out of the economy the entrepreneurial efforts for new value creation, and it removes money from the other markets that would normally have funded them.



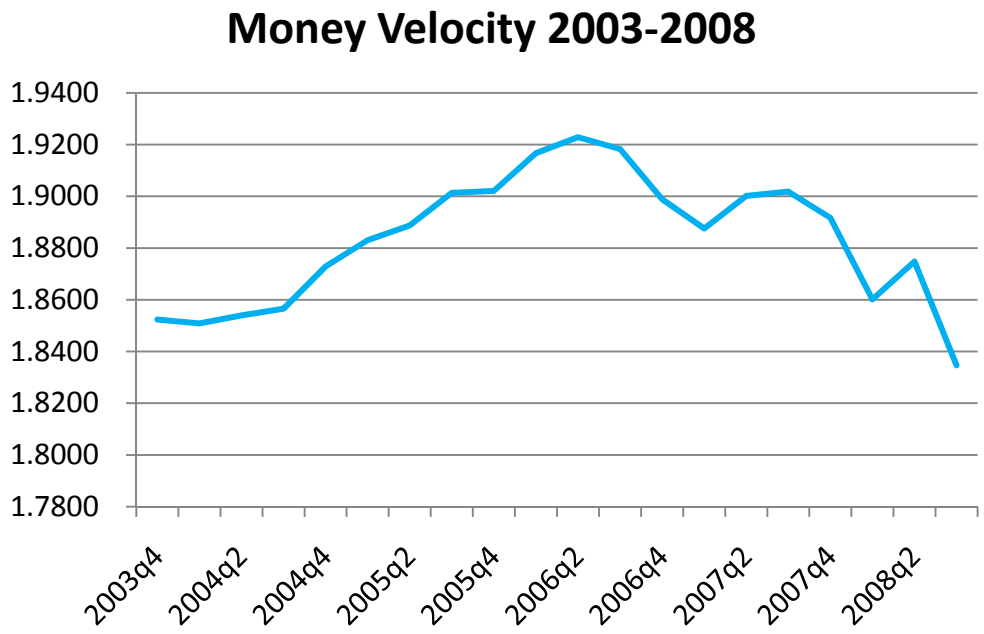
The following shows M2. M1 shows the rapid rise whereas M2 id more smooth. The concern from a monetarist view is the explosion of M2 which will cause inflation. However there is a deflationary fear at this time. This may be the reason for the M2 stability.



The GDP is growing but clearly is slowing in adjusted values. GDP in normalized values has now become flat and it is expected to be negative in Q4 2008.



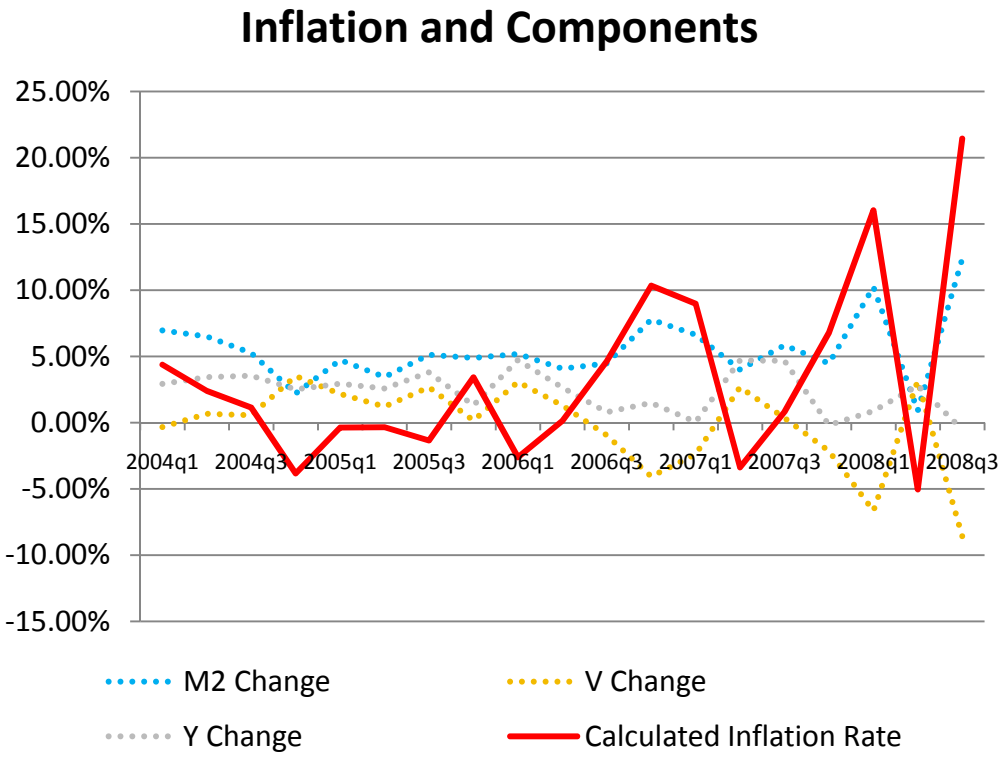
The velocity of money from 2003 thru Q2 2008 is shown below. There appears to be a precipitous drop, as would be expected, and the drop may continue aggressively thru Q4 even as the FED pumps cash into the economy. Clearly this is a recession but more importantly, if one follows a neo-Keynesian school, as expected by Summers and Bernanke, then we would see the Government send massive amounts to the infrastructure side. However, the classic infrastructure dilemma is one of slow deployment and frankly waste versus large deployments of funds. It is just not possible to start up this set of expenditures on roads sand the like for a multiple set of reasons, the dominant one being the lack of labor. Also there is the flow of materials required which has dramatic time lags. The same effect occurs in the deployment of broadband infrastructure, albeit the labor is a bit more skilled and diverse from constructions. However the rural deployment would potentially drain labor from current urban and suburban projects or just force labor costs up across the board. Despite the drop in money velocity, it is possible to see an inflationary trend resulting from these uncontrolled stimuli packages since they are so heavily back-ended in time.



7. **In the long term. inflation will become a significant factor and broadband infrastructure investments by the Government will merely exacerbate that with no room for entrepreneurial growth.** Finally we can see what the calculated inflation rate is given the most recent monetary policy efforts. Using the simple relationship between money supply, GDP, velocity and inflation we have plotted the equilibrium imputed inflation using the data available[13]. Note that in Q3 2008 the monetary policy

[13] see Dornbusch, Fischer, Macroeconomics, 5th Ed, McGraw Hill, NY 1990 p. 643.

has driven inflation to an annualized rate of 22%. This does not include the Q4 stimulus or the Q1-4 2009 stimulus package[14].



Clearly as the Government increases the M2 amount, and as the economy slips further making both GDP and velocity numbers decline, the imputed inflation rates would tend to soar. The impact of this long term could then be devastating. Thus the deployment of this broadband strategy could just be another of the many steps leading to the decline of the US economy in the long run with a de minimis is any stimulus in the short run.

[14] The derivation of the inflation rate is based upon the Dornbusch analysis. Recall that we have the following identify of MV=PY, where M is the M2 supply, V the velocity of money, Y the GDP and P the price index which is reflective of inflation. Now if we differentiate and divide each side we obtain:

$$\frac{\partial(MV)}{\partial t} = \frac{\partial M}{\partial t}V + M\frac{\partial V}{\partial t}$$

and dividing:

$$mV + Mv =$$

$$m\frac{V}{MV} + v\frac{M}{MV} = \frac{m}{M} + \frac{v}{V}$$

likewise

$$\frac{p}{P} + \frac{y}{Y} = \frac{m}{M} + \frac{v}{V}$$

this yields the relationship. Since p/P is the normalized inflation rate we get it from the above.