

ΣΠΟΥΔΑΙ / SPOUDAI

ΕΤΟΣ 1999 ΙΑΝΟΥΑΡΙΟΣ - ΔΕΚΕΜΒΡΙΟΣ ΤΟΜΟΣ 49 ΤΕΥΧ. 1-4

YEAR 1999 JANUARY - DECEMBER VOL. 49 No 1-4

ESTIMATION OF POTENTIAL GROWTH RATE* (With application to USA, Europe and East Asia)

By

Laurence R. Klein

Nobel Laureate

Professor of Economics, Emeritus

University of Pennsylvania, U.S. A

Some Basic Concepts

Economic policy makers, the world over, are deeply concerned with two real magnitudes —the real growth and the unemployment rate. They are naturally concerned about many targets and indicators - inflation rate, external payments imbalances, internal fiscal imbalances, vital health statistics, educational achievement, productivity, voting patterns, popular opinion, and several others. In setting macroeconomic policy, they often look first at output growth and unemployment.

That has definitely been the case in the United States and was possibly only partially true in Europe or Japan. After the appearance of several social democratic officials in Europe during the past two years, it has been increasingly so there too.

Although the monetary authorities and financial ministers often regard the inflation rate as the indicator of their primary concern, they often watch the two real indicators (output growth and unemployment) for indications about future tendencies of inflation. When they want to engineer or assist either a

* This article is revised draft of the lecture given at the University of Piraeus on June 7th 1999, on the occasion of granting Professor Klein a honorary Doctorate degree by the department of Economics.

vigorous "take-off or a "soft-landing" they consult the real indicators. To some extent, monetaries consult the movement of monetary aggregates, but that has become less prevalent in recent years, especially because technological changes in banking and finance have upset familiar patterns of the conventional aggregates.

The two real indicators are watched carefully, but not entirely, in their own right; they are watched in special ways, however, for their signaling power of inflation. This is particularly true for monetary authorities, but also for other officials, academic economists, and market participants who are, themselves, watching the monetary authorities (FED, Bundesbank, Bank of England, Bank of Japan,...).

Mainstream economics, largely following central bank fashions have developed two concepts in connection with dynamics of the two real indicators. These two are: *potential* growth rate and unemployment at *full* employment. The academicians have turned the latter concept into NAIRU, the Non Accelerating-Inflation Rate of Unemployment. In this paper, I want to challenge conventional wisdom about the present levels of these two concepts and also their scholarly (or "scientific") merit.

Broadly speaking, both concepts — **potential** growth and NAIRU — are fixed in people's minds at best levels (highest for growth and lowest for unemployment) that permit the economy to function without undue inflation. In the relationships between growth or unemployment, on the one hand, and inflation on the other, most authorities would really like to have practically **zero** inflation, but most policy makers are realistic enough to accept low single-digit values instead of zero (say two-to-three percent) in the advanced industrial countries and between 5 and 10 percent (staying within single figures) in developing countries. Some officials, however, are not just being pragmatic in accepting small positive values of inflation; they feel that it makes for a healthy economy to have a small bit of inflation, at about 2 or 3 percent¹. The important thing is to avoid **accelerating** inflation, and I believe that small amounts of inflation do not signal inevitably that accelerating inflation will naturally develop.

In the case of **potential** growth, I shall argue that the present generation of young economists have been too ready to accept a very low rate of output growth in order to insure themselves against inflation. The two real magnitudes are related, but do not contain identical information about the economy, and they are often misjudged for the setting of critical targets. They serve as "speed limits" for the economy. The US public authorities, both monetary and general

economic officials, have misjudged productivity gains in determining how high real output growth could be, without sparking off an accelerating burst of inflation.

In the case of NAIRU, it is my opinion that the rate of unemployment is unusually difficult to estimate, within a reasonable range of uncertainty. It is well known, that an error band, of some significant degree of uncertainty, is often associated with so-called **residual** estimates. The unemployment rate is estimated as:

$$\text{unemployment rate} = \frac{\text{labor force} - \text{employment}}{\text{labor force}}$$

This means that unemployment is a "residual" estimate, being, in the numerator, and is subject to two kinds of errors, errors in the estimation of labor force and errors in the estimation of employment. To the extent that these measurement errors are not offsetting, we find that the variance of the numerator is the sum of two variances - that of labor force and that of total employment. Estimates of unemployment have such large sampling variability that many popular estimates of the NAIRU are subject to large error bands, so large, in some cases, that it can be estimated that every observed unemployment rate for a nation falls within the same confidence region, meaning that it is very difficult, if not impossible, to determine that any of the observed levels of unemployment could be called a NAIRU value. That hardly makes for any confidence in saying a particular level of unemployment at any time period is a NAIRU level.

Practical or rule of thumb estimates of growth potential or of unemployment at full employment have been used. A popular approach, used by several economists in the United States is to start from the identity (truism).

output = (population) * (participation rate) * (worker productivity)

$$X = P * \frac{L}{P} * \frac{X}{L}$$

X = output, P = production, L = Labor force, X = output

If L is **labor force** rather than **employment**, then this statement shows a **potential** barrier to growth, namely, worker power available. A variation on this identity is

$$\ln X = \ln P + \ln \left(\frac{L}{P} \right) + \ln \left(\frac{X}{L} \right)$$

$$\frac{d \ln X}{dt} = \frac{d \ln P}{dt} + \frac{d \ln (L/P)}{dt} + \frac{d \ln (X/L)}{dt}$$

where $\frac{d \ln (...)}{dt} = \text{approx. percentage rate of change of } (...)$.

It is argued, often with great confidence, that growth rates of population, labor force participation, and worker productivity are known, on the basis of trend measurements and that the economy of the US, e.g., is "locked" into a growth position at about 2,5%, because each of these components is presently unchangeable. I regard this approach as much too superficial, for the following reasons:

(1) Labor force participation has not been fully extended. It is sensitive to the overall economic situation. When unemployment is high, as a result of restrictive policies —possibly those aiming primarily at inflation— we often find the well recognized "discouraged worker effect". Now, in the United States, when the economy has been allowed to break loose from the low growth estimates of 2.5% potential, participation has been found to rise.

(2) Productivity in many economies suffered during the oil crises of the 1970s. This might have been due to national policies, designed to deal with impending crisis situations, but in any event they presented a poor record on efficiency and productivity. At the present time there are signs of emergence from this period of slow productivity growth. I would cite the information sector contributions to overall economic efficiency, the improvements in infrastructure (some of this from the information infrastructure) and the development of new lines of exports and productivity improvement, outside the information sector. One such line is biotechnology, which was slower than information technology in making its effect felt.

(3) Population growth depends on fertility, death rates, and immigration. Fertility is predictable in the very short run, as it changes quite slowly in most cases. There is not much evidence in support of an upsurge in fertility, but it could happen gradually. Immigration, however, has been taking place on a large scale and can effect the outcome for estimating population growth in a significant way, as can the death rate, if the attitudes toward normal retirement ages are extended.

If the simple rule — of — thumb/identity analysis is not to be our main guide, where can we look for more detailed analysis? One part of the answer lies in the statistical investigation of production functions, or, more broadly, production processes. The production function sets the tone for understanding the supply side of the economy. Economists have used very simple and mathematically tractable specifications for production functions —often assuming that average productivity measures are constant (a rule-of-thumb) or that simple log-linear expressions, or semilog-linear functions express the physical limitations of converting factor inputs into outputs. Personally, I prefer to go back to an elementary concept, that is basic in the teaching of economic principles, of an S — shaped function, i.e. S-shaped in 2-dimensional cuts into multivariate relationships. I want to use functions that show the transition from increasing-to-decreasing marginal productivities and allow for increasing returns to scale. Much of theoretical economics is expressed in decreasing returns or constant returns to scale. These are important for equilibrium positions, but the dynamic moving system is hardly well described by equilibrium or even moving equilibrium positions. In the world around us, we are constantly experiencing mergers and acquisitions among firms who often cite as their objectives: to reduce costs by "downsizing" within the merged units, or to realize the economies of scale in global markets. They change configurations of firm operations (inputting and outputting) cross industries, across national boundaries, and across functional operations within firms. Some active participants in this never-ending quest for **more** profits (not **maximum** profits) blindly think in equilibrium terms, and the concepts of **potential** output and **full** employment hardly seem to be appropriate in the modern business climate.

Some Macroeconomic Observations

In the United States, the Federal Reserve Authorities adopted standards for **potential** growth at about 2.5% p.a., and **full** employment at about 6%. Until recently, they intervened to try to restrain the economy if output were expanding faster and unemployment were lower. They would consider stimulating the economy if output were significantly slower and unemployment higher than these two limits. These conditions were in force at the FED, but also in the Administration for some time. In the legislative branch, the Congressional Budget Office worked with similar limits, and I can remember when they even had much lower estimates for potential growth at the CBO. These numbers are approximate because the underlying statistical data have been changed from time-to-time, redefining price indexes, redefining female employment, or making

other numerical changes in the statistical series from which the estimates are computed.

Nevertheless, we have had many months of US economic performance during which production has grown at a much higher rate (more than 3% or 4%) and unemployment reduced to much lower rates (below 5%) without there being any **accelerating** effects on inflation. When these discrepancies first appeared, the economic authorities tried to restrain the economy, but to no avail. This was partly because their policy instruments are not very effective. The short term interest rate is only loosely related to the entire yield curve; competitive pricing forces held down inflation; labor market flexibility held back wage demands; and productivity was poorly estimated.

As the situation continued, there was some difference of opinion among US policy makers. Alan Greenspan decided to be more experimental and watched to see if the economy could continue to perform at strong values (outside the prevailing limit) without sparking inflation. That attitude continues. Also the fear of disturbing the crisis-ridden world economy by imposing restraint on the strong economy held repressive financial measures in check.

Not only did Alan Greenspan come round to this experimental view, but also the President and Vice-President indicated that somehow the information technologies have changed the productivity environment and outlook. This has yet to be proved, but the data are very suggestive.

Many business leaders and some economists argued against the prevailing speed limits placed on the US economy². Although the collected views were first published in 1998, the arguments were being made (to no avail) since 1994.

Does it matter if the economy outperforms the overly conservative limits imposed by the authorities? I believe that underachieving errors are just as important as overachieving errors. There are always many worthy projects or other used for available funds, and such needs could have been attended. For example it required several years of good growth to bring the deficit to zero and then to large surplus. This process suffered the prevailing deficit trap much too long before it could finally be realized. Now, commentators are looking with pride at the employment of some traditionally underprivileged or marginal socio-economic groups. That is a fine benefit, but it took several years of underachieving performance to bring the US economy to the point at which the situation could finally be turned toward more economic equality. There is

nothing like a strong economy to improve aspects of uneven income distribution or a wider range of budgetary restraints of large, persistent deficits.

The European expansion is much less impressive than that in the United States, that is why so many observers are characterizing the World situation as one of a single star performer. With the European fixation, in the West, on the Maastricht Requirements during the years leading up to January 1, 1999, there has been comparatively little contribution to the needs of developing countries in financial distress. There has also been relatively little contribution of the European economy to their own socioeconomic problems, mainly the prevalence of high rates of unemployment.

It is, of course, appropriate to argue that the European unemployment problem is primarily a structural issue, but this conclusion has been reached with very little, if any, attempt to examine an alternative path to full employment through higher growth. Some experimental attitudes like those among US policy makers (recently) would be refreshing in Europe. Not only could unemployment improve under higher growth conditions but also domestic public deficits could be improved. Both US problems —unemployment and the federal deficit— came down under the stimulative pressure of higher growth performance.

Fiscal consolidation, which was the European policy approach to meet Maastricht criteria, is essentially a **restrictive** policy, in a mode of classical policy restraint. It did bring several European nations to their targets; but some creative accounting and, more importantly, sluggish growth were needed in order to declare victory. It was not a victory that best served the world economy in a time of crisis, but one cannot argue that it was, in fact, a failure.

It is not too late, however, and Europe can test the ground, to see if stronger growth can be achieved without accelerating inflation. There must be some good productivity growth to accompany overall output growth, some more downsizing in the US manner, flexible labor markets in which people shift activities in search of new occupations, and some industrial reorganization. Attitudes towards immigration may also have to be liberalized.

Japan, too, like Europe needs stimuli towards high growth. While Europe still has some room for monetary easing, this is more of a barrier in Japan, where interest rates are extremely low. In 1996 and earlier in 1990-1991 Japan had some respectable growth rates between 3.0 and 5.0% p.a. These were partly achieved through explicit use of fiscal policy, in the form of Keynesian medicine, and there was no inflation flare-up. Just as Europe needs structural reform in

labor markets in order to lend support to lowering unemployment, Japan, too, needs to modernize labor market practices and institutions to fit with globalization of the international economy. The lifetime employment practice is being modified and may have to be abandoned.

When both Europe and Japan simultaneously restructure, where needed most urgently, and undertake programs of stimulus to the macroeconomy, they may find, as did US policy makers, that the potential growth rate is indeed, much higher than they had supposed.

The discussion of Japanese prospects and policies brings us to East Asia, but the bulk of the troubled population is on mainland Asia or nearby (islands) land masses. It is important to consider a return of East Asia to growth leadership. This area includes RoK, Hong Kong, Singapore, other ASEAN states, and especially, China. They will benefit by the reset-of-the-world's return to normalcy, but they can enhance the process to move into a better start for recovery by implementing fiscal stimuli on their own part. Since a few of these countries are recipients of IMF-structured loan agreements, they would naturally not want to alienate the IMF teams, to whom they are responsible; therefore it would be highly beneficial if the stricken East Asian economies can obtain permission to let their respective governments run larger fiscal deficits. The countries involved have enough experience managing their own affairs and should be able to give enough new support, together with deficit spending, to get the economic pumps primed and ready for new action, beyond that of their earlier history when fiscal policy was more conservative and strict. In a simulation, structured as follows: G-7 countries stimulate through reductions in short term interest rates (100 basis points), North American (US and Canada) participants asked for reductions of interest rates by 150 basis points. No change was contemplated for Brazil, Argentina, or Mexico. The East Asian nations were assumed to turn to increasing deficits as fiscal stimuli, amounting to 1.5% of their respective GDP values. This combination has attraction as an expansionary scenario. The joint outcome is quite satisfactory (on paper, that is to say) with world production and world trade rising by one or two percentage points. The whole coordinated stimulus package, across countries, is topped off by increases in Japan's ODA by \$ 30 bn. distributed to troubled Asian economies.

The Role of Productivity Gains

The joint policies fit together well, but their fit needs participation from the technology (supply) side. From the demand side there is much interest in active,

crowded markets, especially those that are familiar in economies growing at 5 or 6% and with fairly steady prices. It is interesting to note at this point that runaway prices were not features of the East Asian economies, prior to their slide into crisis.

As noted earlier, in connection with US economic performance now, there ought to be grounds for technical progress in order to insure expansionary gains without inflation. What can we say now about production possibilities?

There are several sources of technical progress to be exploited in the drive for higher productivity, in order to give additional confidence in an expansion without much inflation. In the first place, production functions must be estimated from specifications that allow for studying the productivity enhancing effects of infrastructure investment. It is a subject under debate, but it is my opinion that carefully planned infrastructure can make noninfrastructure capital more productive. This has been examined in two modes: (1) public infrastructure does seem to contribute to overall productivity growth, (2) private infrastructure (e.g. modern Telecommunications systems) may also contribute to the productivity of noninformation fixed capital and to human capital to bring about general technical progress.

The first form of infrastructure was examined by Aschauer in a highly provocative study, which has been unfairly criticized³. It is particularly important to allow for the unusual effects of the energy crises of the 1970s, as **outliers**, in order to ascertain the full importance of his work. In a study about to be published, I, with two colleagues, have found that the S-shaped production function can play an important role in studying infrastructure effects, and we obtain results in support of the Aschauer findings⁴. In the nonlinear approach, with an S-shaped function we can generalize conventional production function analysis and also allow for the possibility of increasing returns.

The production function analysis to allow for embodied technical progress, especially in human capital, and increasing returns, and the particular contributions of information technology is presently being studied across industry groupings by Yuzo Kumasaka and Kazunori Minetaki. Their findings are not yet complete, but their studies at this point do show some particular gains through exploitation of information capital, and this is obviously, if fully validated, a good reason to look for higher growth rates, than would ordinarily prevail without the added gains through expanding use of the new methods of collecting and distributing information.

Information technology is not the only new source, to be more fully exploited for technological progress. Biotechnology is fully as promising, but its fruits may be realized along a more difficult and slower path.

One point to be made clear is that the entire service sector of individual economies and of the global economy is already playing an increasingly important role. This industrial transformation is certainly present but difficult to measure, with presently available statistical information. It requires more painstaking work with thorny measurement problems. It is, however, no less important for that reason.

**GDP Growth, Unemployment and Inflation
USA, Canada, Japan and European Union**

GDP Growth	1996	1997	1998	1999 est.	2000 est.
USA	3.4	3.9	3.9	3.6	2.0
Canada	1.2	3.8	3.0	2.9	2.8
Japan	5.1	1.4	-2.8	-0.9	0.0
European Union	1.8	2.7	2.8	1.9	2.4
Unemployment Rate					
USA	5.4	4.9	4.5	4.1	4.4
Canada	9.7	9.2	8.3	7.8	7.7
Japan	3.4	3.4	4.1	4.9	5.3
European Union	11.3	11.2	10.5	10.1	9.8
Inflation (GDP deflator)					
USA	1.9	1.9	1.0	1.1	1.5
Canada	1.5	0.7	-0.4	1.0	1.9
Japan	-1.4	0.1	0.4	-0.7	-0.6
European Union	2.5	1.7	1.8	1.7	1.7

Footnotes

1. In the immediate post war (II) world, some 50 years ago, it was often asserted, without convincing demonstration that **creeping** inflation at about 2% p.a., inevitably turned into **galloping** inflation.

2. See, *The Rising Tide*, ed. by Jerry J. Jasinowski, (New York: Wiley) 1997.

3. David A. Aschauer, "Is Public Expenditure Productive?", *Journal of Monetary Economics*, 23 (1989), 177-200.

4. Vijaya Duggal, Cynthia Saltzman, and Lawrence Klein, "Infrastructure and Productivity: A Nonlinear Approach", to be published in the *Journal of Econometrics*.