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THE LIFE CYCLE OF US ECONOMIC EXPANSIONS

Edward E. Leamer

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ABSTRACT

Graphs that allow side by side comparisons of the six longer US expansions since 1950 suggest that these expansions have four distinct phases: (1) a high growth recovery during which the rate of unemployment declines to its pre-recession level, (2) a modest growth plateau during which the rate of unemployment is constant, (3) a growth spurt that drives unemployment down further and (4) a second plateau with modest growth and constant rate of unemployment. There have been only three expansions that have experienced the spurt and none has experienced a second spurt. These phases involve substantially different rates of GDP growth, but within each of these four phases GDP growth is largely unpredictable. Forecast accuracy thus comes mostly from understanding the transitions. This requires both data and economics. The economics takes the form of a predator/prey model of the cycle, where the prey are investment opportunities and the predators are entrepreneurs. A probit model of the transition into recession raises concerns about how much longer the aged Bush/Clinton expansion can last.

Edward E. Leamer
Chauncey J. Medberry Professor of Management
Professor of Economics and Statistics
Director, UCLA Anderson Business Forecast
and NBER
edward.leamer@anderson.ucla.edu

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Edward E. Leamer
Chauncey J. Medberry Professor of Management
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Introduction

This paper offers a look at US macro economic history over the last half of the 20th Century with a series of graphs that allow a direct comparison of the six major US economic expansions since 1950. Among the series displayed are unemployment, investment, inflation, interest rates, government spending, equities prices and energy prices. These displays are the basis for a series of conclusions, some more tentative than others, about the life cycle of US expansions.

From the behavior of unemployment, I argue that these expansions have four distinct phases: recovery, plateau, spurt and plateau. In the initial high-growth recovery phase, the rate of unemployment literally recovers and is driven down by high GDP growth to the level it had been prior to the recession that preceded the expansion. Once the previously employed are back at work, the expansion slows and the rate of unemployment levels off at its first plateau. This first plateau was reached after 6 quarters by the Kennedy/Johnson expansion and 8 quarters for the Reagan expansion but it took 16 quarters for the relatively slow Bush/Clinton expansion. After as many as ten quarters in this first plateau, with the rate of unemployment level and growth good but not exceptional, an expansion may get a second wind with a high-growth spurt and another sharp drop in the rate of unemployment. The Kennedy/Johnson spurt lasted 6 quarters and the Reagan spurt 5 quarters but the Clinton spurt was 17 quarters in duration. After the spurt, the expansion enters into another plateau period with good but not exceptional growth and with the unemployment rate stuck again. Not all US expansions have experienced a spurt of growth, and none has experienced a second spurt. The Bush/Clinton expansion entered its second plateau in the third quarter of the year 2000.

Within each of these four phases of recovery, plateau, spurt and plateau, there is very little predictability of GDP growth on a quarter-by-quarter basis. However, the growth rates differ significantly

among these phases. Annualized growth has averaged -0.6% in the recessions, 5% in the recovery, 4% in the first plateau period, 5% again in the spurt, and 3% in the final plateau. These differences in growth rates allow a forecast to have value to the extent that it can accurately predict transitions between phases. Linear vector autoregressions and their equivalents do not adequately focus on these transitions. These forecasts are subject to "regression toward the mean" in which a forecast necessarily looks more and more like the historical mean as one attempts to predict farther into the future. Because the memory in the GDP growth time series is so minor, the force of regression toward the mean is very powerful, and most technical forecasters produce numbers that differ very little from the historical mean of 3% even a single quarter into the future. Recession forecasts are virtually impossible with these approaches. Indeed, with growth in the last quarter of 2000 announced to be an anemic 1.4%, still these forecasts call for 3% growth for all of 2001, producing what Wall Street has called the V scenario, thus suggesting that both strokes of the V were part of the forecast, when it is only the reversion-to-the-mean upward stroke that is the intellectual product of the analysts.

In addition to providing a series of data displays that reveal features of the life cycles of the six major US expansions, I report a probit analysis that predicts the transition of the Bush/Clinton expansion into a recession phase. This is the modeling that led the Anderson/UCLA Business Forecast in December of last year to predict a 60% chance of recession in 2001. Other studies of the transition into recession include Stock and Watson(1989), Estrella and Hardouvelis(1991) and Estrella and Mishkin(1998). The statistical probit model reported here is different from the Estrella et.al. probit models in two ways. First I take as data the transition points between the recoveries and the plateaus, and I thus exploit the fact that the time series properties of the data in the recovery should not influence the prediction of the transition from the plateau into recession. For example, the rise in unemployment in the first several quarters of a recovery is not an early warning sign of an economic downturn at that time, while a similar rise in unemployment during a plateau does suggest (mildly) the end of an expansion. Secondly, the binary indicator that I use in my probit analysis takes on the value one in the last four quarters of each of the expansions, while the Estrella et.al. indicator is a time-shift of the recession periods, which creates a statistical target period that varies in length as the recession periods vary in length, that may overlap the recessions and that may not include the quarters at end of the expansions.

The graphical and numerical analyses that lead to the uncovering of the four phases is subject to serious data mining issues since the set of patterns that the eye and the computer together can perceive is both very great and impossible to define mathematically. It is thus pointless to try to attach precise measures of statistical confidence to the validity of these patterns, but I suspect the graphs will be persuasive. The statistical concerns about the validity of this visual and numerical evidence can be assuaged with words that make the patterns plausible. The story of the cycle that these patterns suggest is what I describe below as "the simple agronomy of the business cycle." In a recession, businesses sit on the sidelines while investment opportunities grow ripe on the trees. When the recovery begins, businesses rush out to pick the low-hanging fruit. The first plateau is reached when the best opportunities are gone. Then businesses go to the credit markets to finance the building of ladders to take them higher into the trees, and they hire workers to climb the ladders and do the picking. When the fruit are too high and too hard to find, when the credit markets make it costly to finance the building of ladders, and when the labor markets make it expensive to pay workers to climb the ladders, the expansion ends and businesses again sit on the sidelines while the orchards fill with fruits of opportunities. This normal cycle can be given a second wind by discoveries of new orchards of opportunities, and possibly by injections of credit that make the ladders easier to finance. The normal cycle can be interrupted by a shock – say a windstorm – that terminates an expansion early, but a shock isn't necessary at the end. Death is a normal consequence of life. Monetary policy, according to this view, should be designed to control access to the orchards of opportunities in an attempt to balance the harvesting rate with the replenishment rate.

This story is the foundation for a search for an answer to the important question: What makes these expansions have a spurt of growth that extends their lives for many quarters? I argue that the Kennedy/Johnson expansion was extended by the burst of government expenditures to support the Vietnam war, that the Reagan expansion was extended by expansionist monetary policy that increased the spread between the rate on 10 Treasury bonds and the rate on 3 month Treasury bills by 175 basis points, and that the Bush/Clinton expansion was driven on by the discovery of the apparent business investment opportunities that the Internet afforded, although the timing allows monetary policy also to take the credit. These conclusions come from a visual examination of many important macro economic times series, but

not all. In other words, just as in formal regression analysis, there may be a variable whose omission is leading me astray.

While it is easy to see in the data favorable events that seemed to have extended the lives of these expansions, it is much more difficult to see any "shocks" that can be implicated in their endings. The Ford/Carter expansion from 1975Q2 to 1980 Q1 is the only one that terminated with a sharp increase in energy prices, but the Bush/Clinton may turn out to be second example.[1] In the other direction, a sharp decline in energy prices came coincidentally with the growth spurts of both the Reagan and the Bush/Clinton expansions. Thus the orchard story needs an energy component: the ladders have electric motors.

In what follows I offer a set of graphs that illustrate the behavior of key macro variables during the six major expansions since World War II. These reveal the troubling signs about the current state of the economy. One graph shows that the Bush/Clinton expansion, which began in the second quarter of 1991, is long and smooth but weak. That contrasts with the Truman expansion in the early 1950s that was brief and volatile but very strong. Another graph shows that the declining unemployment rate in the long expansions has an early plateau and a late plateau. The Bush/Clinton expansion is now at its second plateau, and not likely to stay there for more than another year. A more prescient indicator of the state of the labor market than unemployment is weekly hours in manufacturing. This indicator of pace of the economy rises dramatically during an expansion but falls off at the end, which is exactly what has been occurring in the last several months. The spread between the long term and the short-term interest rates also has a very distinctive path over an expansion, first widening and then tightening. That spread was negative in the last month of 2000, signaling strongly that the end of this expansion is imminent. But of course the finance story of the last five years has not been bank loans or corporate bonds. It has been the bull market in US equities that created unprecedented opportunities for the financing of New Economy start-ups. The equities markets are now saying no more.

[1] The big energy price shock in 1974 Q1 came two quarters after my termination date of 1973 Q2 for the Nixon expansion. This termination data is based on negative growth both in 1973 Q3 (-1.6%) and 1974 Q1 (-3.0%). An alternative termination date for the Nixon expansion would be 1974 Q2 which was followed by two negative quarters. This would put the Nixon expansion in the first but faltering plateau when the 1973 shock occurred and would point to the energy price increase as the terminating factor.

After examining these graphs, I present a probit analysis that predicts the chance that the Bush/Clinton expansion will transition into a recession based on the behavior of the interest rate spread, the unemployment rate and the ratio of profits to investment. This kind of analysis can yield estimated probabilities for the end of the Bush/Clinton expansion as high as 80% or more. In contrast, the index of leading indicators does a relatively poor job at predicting the ends of expansions, presumably because it is designed to predict the course of the economy in recessions and recoveries as well as the transition from plateau to recession. Better, I suggest, to have four transition indicators: from recession to recovery, from recovery to plateau, from spurt to plateau and from plateau to recession, leaving the transition from plateau to spurt unpredictable because of its natural randomness. Consistent with the orchards story, I will show below that profitability predicts the transition from recession to recovery and the lack of profitability predicts the transition from plateau to recession, but profits do not help understand the transition from recovery to plateau. That occurs when the low-hanging branches are picked clean.

Six Economic Expansions

The Bush/Clinton expansion which began in 1991 is now 39 quarters old. This is longer than any of the five other expansions since World War II. Data on the growth of real GDP for these six economic expansions are summarized in **Table 1** which contains the length in quarters, the average growth, the standard deviation of growth (a measure of volatility) and the cumulative growth. The growth rates of real GDP and the six sustained expansions are illustrated in **Figure 1.** Cumulative growth over the expansions is illustrated in **Figure 2,** where the real GDP is normalized to be equal to one at the start of each expansion to facilitate comparisons.

Table 1

Growth of Real GDP in Six Expansions

Period	President	Federal Reserve	Quarters	Mean	Std. Dev.	Total
1950:1 - 1953:2	Truman	McCabe/McMartin	14	7.6%	5.6%	28%
1961:1 - 1969:3	Kennedy/Johnson	McMartin	35	5.0%	3.0%	53%
1971:1 - 1973:2	Nixon	Burns	10	6.1%	3.7%	16%
1975:2 - 1980.1	Ford/Carter	Burns/Miller	20	4.4%	3.9%	24%
1982:4 - 1990:2	Reagan	Volcker	31	4.2%	2.4%	37%
1991:2 -	Bush/Clinton	Greenspan	39	3.7%	1.9%	41%

The 39 quarters of the Bush/Clinton expansion exceed the 35 quarters of the Kennedy/Johnson expansion and 31 quarters of the Reagan expansion. Although the Bush/Clinton expansion is the longest, it is also the slowest, with a cumulative growth of 42%, less than the Kennedy/Johnson cumulative of 53%, and only slightly larger than the Reagan cumulative of 37%.

The Bush/Clinton expansion is also the smoothest, with a standard deviation of quarterly real GDP growth of 1.9% compared with the Reagan standard deviation of 2.4% and the Kennedy/Johnson standard deviation of 3%. Generally, the last fifty years have come with a trend toward slower but more stable growth. Even since 1995, when the economy went into "high gear" the mean growth has been only 4.1%, lower than any of the other six expansions.

Figure 1

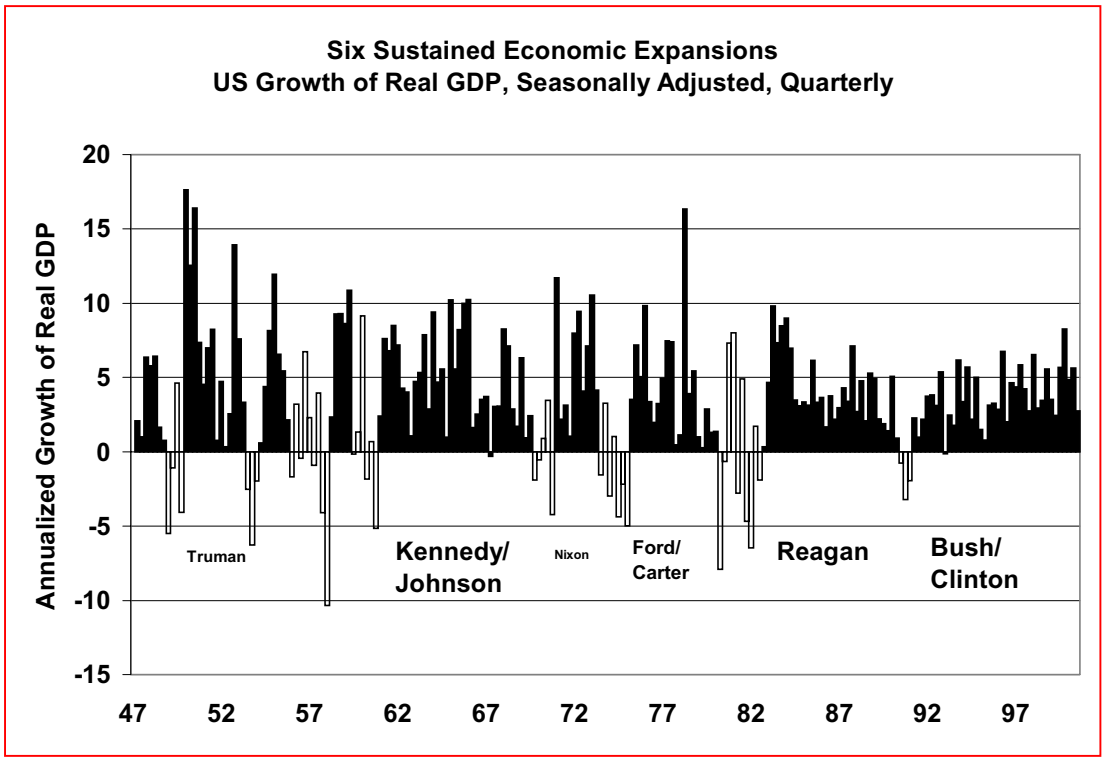
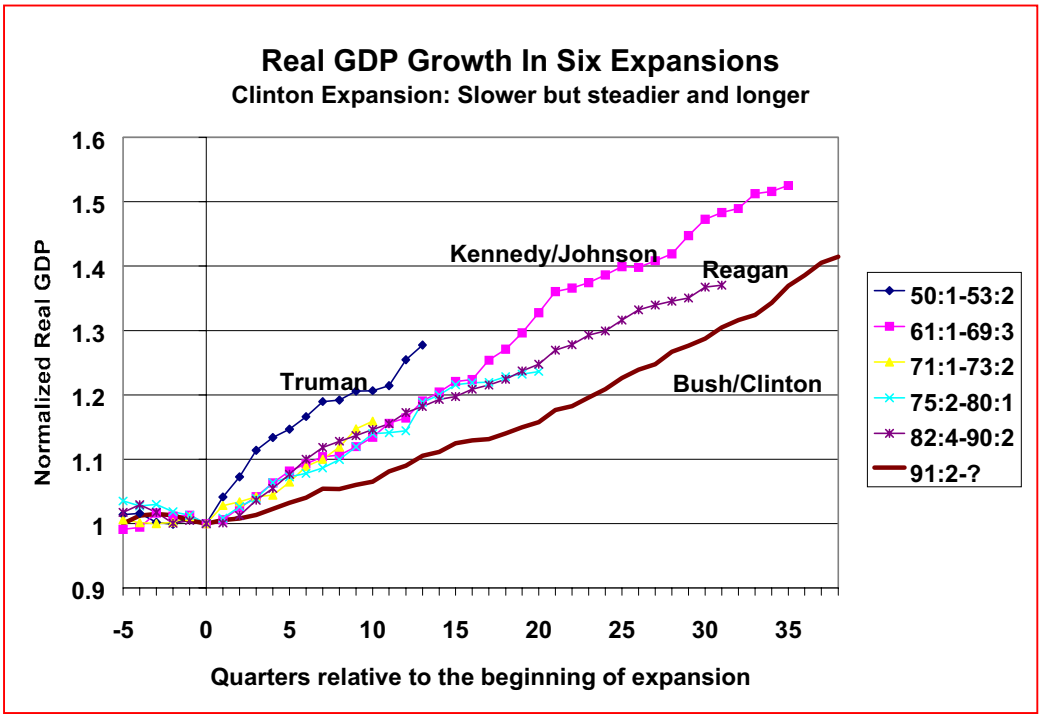
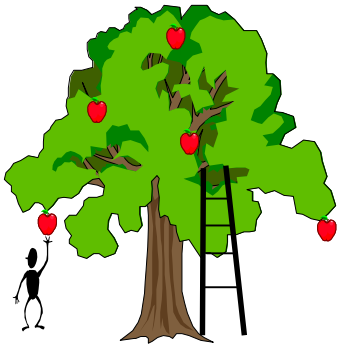


Figure 2



The Simple Agronomy of the Business Cycle

An economic theory of the cycle will prove very helpful in looking at the subsequent graphs. Here is a simple story that captures a large part of reality. At the start of the recovery, businesses rush out to pick the low-hanging fruit. Inevitably, the opportunities get harder to find, and firms are forced to seek credit to finance the building of ladders that let them pick from the higher branches. The first businesses to turn to the credit markets find the terms very favorable, with creditors offering low interest rates and expecting little collateral. But all this picking can increase the cost of labor and the cost of ladders. As more and more firms seek more and more credit to build ladders higher and higher, the banks and other credit sources start to worry about bankruptcies and start to insist on higher interest rates, more collateral and more clear evidence of high quality fruit on the branches. When credit gets too tight, labor too expensive and the remaining opportunities too meager, the expansion ends, the businesses abandon the picked-over trees, leaving the orchards time to replenish themselves. And the cycle starts all over again.



The basic economic pathology that this model embodies is a lack of property rights. No one owns the orchards of opportunities. The tragedy of the commons is amplified because the fruit are more valuable when the picking is intense – investments have high rates of return when growth is great.[2] Essentially the same idea is embodied in the predator/prey cycles in Smith(1974). Here the prey are business investment opportunities and the predators are entrepreneurs. [3]

Monetary policy, according to this view, should not attempt to extend an expansion beyond its normal life, but instead should limit access to the commons with appropriately high real rates of interest, attempting to keep the harvest rate equal to the replenishing rate, and thus allowing an expansion to live forever. This task may be relatively easy when technology has been constant and when history can serve as a guide for the optimal harvesting rate, but the optimal control of access to the commons following

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[2] This story of the cycle has much in similarity to the more complicated offering of Zarnowitz(1999) who "ties together profits, investment, credit, stock prices, inflation and interest rates."

[3] The Volterra(1926) equations with E standing for entrepreneurs and O for investment opportunities are

$\dot{O} = aO - bO^2 - cOE$, where investment is OE.

$\dot{E} = -eE + c'OE$

bursts of new technologies like the Internet requires a level of clairvoyance about the nature of that orchard of opportunities that is unlikely to be available. Still, we knew that the Internet orchard was being seriously overharvested, didn't we?

Labor markets mark the life cycle of the economic expansions

There is very little memory in the GDP growth series and nothing exceptional with which to define phases of an expansion. Employment data are very different and have a distinct path over the life cycle of an expansion. The four-phase tightening of the labor markets that is characteristic of an expansion is illustrated in **Figure 3**. To facilitate comparisons across expansions **Figure 4** displays these unemployment rates normalized to the level in the fifth quarter prior to the beginning of the expansion. In this figure, we see the four phases of the expansion: the recovery, the first plateau, a growth spurt and the second plateau.

Unemployment, which rises prior to the onset of an expansion, usually continues to rise even during the first quarter or two of an expansion. The unemployment rate is rapidly driven down during the recovery period to a level attained prior to the recession preceding the expansion. Then unemployment stalls and stays constant for many quarters. A spurt of growth propels unemployment down to another plateau where it holds steady until the end of the expansion.

Although there is some upward rise in the rate of unemployment at the ends of three of these expansions, a more reliable early warning signal of an impending recession is weekly hours per worker in manufacturing illustrated in **Figure 5.** Changes in hours precede changes in employment because firms have considerable flexibility to adjust hours in response to sales drops or sales increases, and only later make layoff or employment commitments. Thus hours per week fall quickly during the recession period preceding the expansion, but turn around right at the beginning of the expansion even as unemployment continues to rise. Weekly hours rise to a peak in the middle of an expansion and generally fall at the end of the expansion. Notice especially the alarming drop in hours in the last two quarters of the Bush/Clinton expansion. But observe also that we have been there before: hours also plummeted in 1996 Q1. Unemployment also ticked up then. The Bush/Clinton quarters 16 to 20 are identified " in Table 2 both as the first plateau and also the "sputter" to emphasize the precariousness of this plateau. We need to be able to understand why the Bush/Clinton expansion did not perish in its 20th quarter.

Figure 3

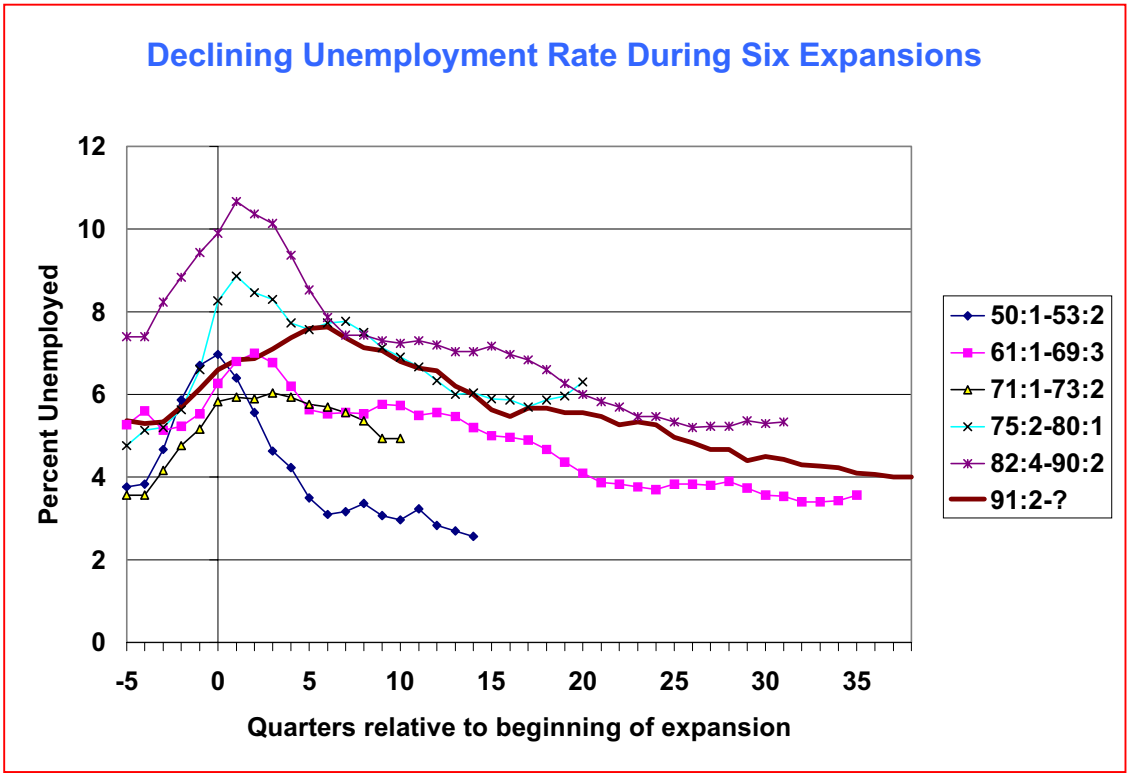


Figure 4

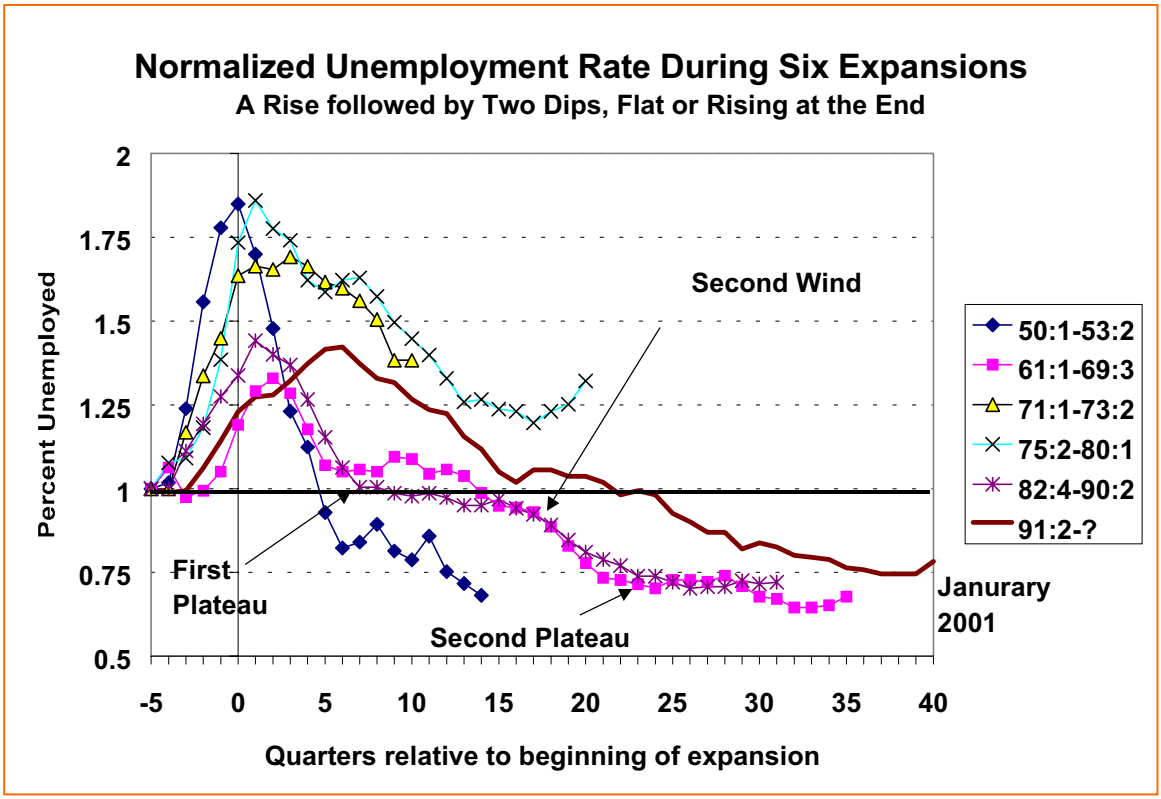
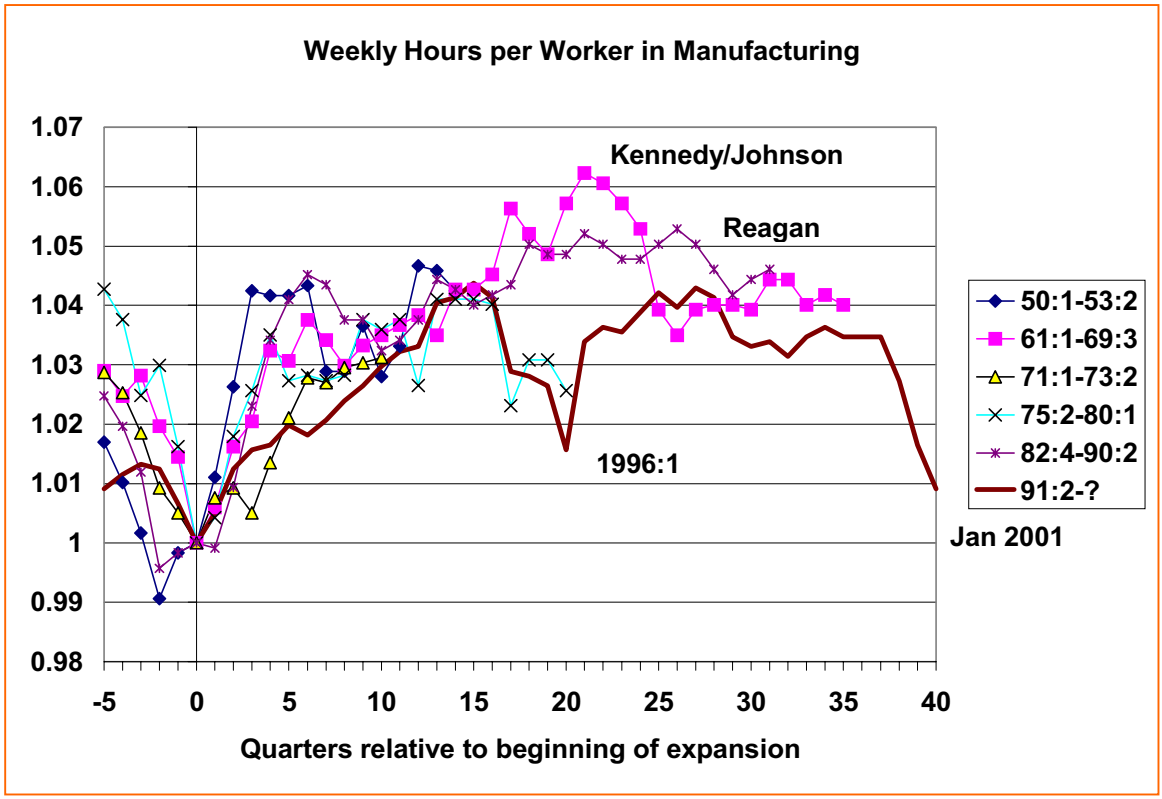


Figure 5



Dating the Phases

My dates for the beginning of the four phases are recorded in **Table 2**. The process by which these dates were determined begins with an initial set of transition points based on visual examination of the path of unemployment in **Figure 4**. For example, it appears that the Bush/Clinton expansion reached it's first plateau in the 16th quarter. Using these initial values, I then estimate a probit model that allows these transitions to depend on the levels of unemployment, weekly hours and the changes thereof. These probit estimates are reported in Table 3. Each of these probit models is estimated using data from only two adjacent phases, and thus each predicts the transition from one phase to the next. For example, the recovery-to-plateau estimates in Table 3 imply that an efficiently constructed index separating the first plateau from the recovery is based on the fact that the first plateau has lower unemployment and more steady weekly hours and unemployment. Next the probit model is used to form predicted probabilities

which are compared with the actual transition point to uncover any serious errors. With adjusted transition points, this process is repeated until "satisfaction" is attained.[4]

Table 2 Dating of the Phases

Year	Q	Phase	Expansion Quarter	Length
Kennedy Johnson Expansion				
1961	1	Recovery	1	5
1962	2	Plateau 1	6	8
1964	**2**	**Spurt**	**14**	8
1966	2	Plateau 2	22	14
1969	4	Recession	36	5
Nixon Expansion				
1971	1	Recovery	1	9
1973	2	Plateau 1	10	1
1973	3	Recession	11	7
Ford/Carter Expansion				
1975	2	Recovery	1	13
1978	3	Plateau 1	14	7
1980	2	Recession	21	10

Year	Q	Phase	Expansion Quarter	Length
Reagan Expansion				
1982	4	Recovery	1	7
1984	3	Plateau 1	8	10
1987	**1**	**Spurt**	**18**	9
1989	2	Plateau 2	27	5
1990	3	Recession	32	3
Bush/Clinton Expansion				
1991	2	Recovery	1	15
1995	1	Plateau 1	16	5
1996	**2**	**Spurt**	**21**	17
2000	3	Plateau 2	38	2+
1995	**1**	**Sputter**	**16-20**	4

Table 3

Probit Transition Estimates

	Recovery to Plateau		Plateau to Spurt		Spurt to Plateau	
Variable	Coefficient	z-Statistic	Coefficient	z-Statistic	Coefficient	z-Statistic
U	-0.7	-3.2	-1.5	-2.6	-0.6	-1.5
D(U)	2.2	2.4	-7.2	-2.6	13.4	2.6
HOURS_WEEKLY	0.2	0.8	1.4	2.2	-3.9	-2.8
D(HOURS_WEEKLY)	-2.8	-2.9	3.6	1.5	-4.7	-1.4
McFadden R-squared		0.3		0.7		0.7

Note: D(X) = X - X(-1) , U = rate of Unemployment

[4] It is best to think of this as an ad-hoc fine-tuning exercise that corrects any glaring errors in the original definition of the phases that is based entirely on the shape of the unemployment time series. A technical error that this approach makes is that the probit model predicts classifications and not transition points, as in Hamilton(1989). More on that in a later paper.

Discussion of Phases

Sample statistics for growth, unemployment and hours are recorded by phase in **Table 4**. These are based on data beginning the third quarter of 1959, five quarters ahead of the Kennedy/Johnson expansion. Thus I am excluding the Truman expansion in the early 1950s which is statistically anomalous..

By construction, the recession period has lower growth, indeed averaging –0.59% compared with the overall average of 3.5%. By construction, unemployment is falling in the recovery and the spurt and holding steady in the two plateaus. Not by deliberate construction, but also not surprising in light of the constructed behavior of unemployment, growth is highest in the recovery and the spurt and more modest in the two plateaus. Not by direct construction, weekly hours in manufacturing is increasing significantly in the recovery, and less so in the spurt. Weekly hours are actually declining in the two plateaus, as firms use the slower growth in sales as an opportunity to reduce overtime and slow the pace of operations

Table 4

Sample Statistics
Growth Rate of Real GDP and Unemployment Rate
Quarterly, 1959 Q3 to 2000 Q4

		Growth				Unemployment Rate			U-U(-1)			
PHASE	Obs.	Mean	Std. Dev.	S.E.*	Rsq	Mean	Std. Dev.	S.E.*	Mean	Std. Dev.	S.E.*	Rsq
Recession	31	-0.59	3.61	4.10	0.10	6.34	1.37	0.40	0.38	0.37	0.40	0.24
Recovery	49	5.23	3.43	3.45	0.05	7.10	1.28	0.23	-0.15	0.33	0.23	0.54
Plateau 1	31	3.40	2.01	2.03	0.08	6.15	0.74	0.13	-0.02	0.13	0.13	0.18
Spurt	34	5.08	2.34	2.32	0.11	4.93	0.68	0.08	-0.14	0.11	0.08	0.47
Plateau 2	21	2.95	2.15	2.28	0.04	4.09	0.71	0.09	0.00	0.09	0.09	0.13
All	166	3.48	3.58	3.48	0.12	5.95	1.46	0.25	-0.01	0.32	0.25	0.42

	Weekly Hours		Change in Hours	
PHASE	Mean	Std. Dev.	Mean	Std. Dev.
Recession	39.87	0.48	-0.19	0.25
Recovery	40.49	0.74	0.15	0.21
Plateau 1	40.62	0.45	-0.05	0.21
Spurt	41.42	0.42	0.06	0.19
Plateau 2	40.84	0.29	-0.08	0.17
All	40.64	0.72	0.00	0.24

S.E.* is the predictive standard error of an order two vector autoregression.
Rsq is the R squared for the vector autoregression.
The sample sizes are smaller for the VARs because of starting up conditions.

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Also in **Table 4** are three measures of volatility: the Standard Deviation of the data, the Standard Error of a regression controlling for past growth and unemployment and the R^2 of that regression. These numbers indicate that within each phase, growth is basically a random variable – the R^2 values are virtually zero - and whatever predictability there may be of GDP growth comes only from knowing which phase is applicable.[5] Unemployment appears much more predictable, but the R^2 of the unemployment equation gives a false sense of predictability since most of the apparent accuracy comes from only from inertia: the best prediction is today's value. Controlling for this inertia by predicting the change in unemployment produces R^2 values that suggest some predictability of the direction of unemployment in the high growth periods of recovery and spurt.

Although unemployment is predictable in both phases, the recovery and the spurt have very different kinds of unemployment equations, which are reported in Table 5. In the recovery, the momentum effect dominates; if unemployment is falling a lot, it tends to continue to fall a lot.[6] In the spurt, there is a mild reversal effect: following a quarter of falling unemployment one is more likely to experience a quarter of rising unemployment. GDP growth doesn't matter perceptibly in creating employment during the recovery but more strongly creates employment during the spurt. Also in the spurt, unemployment is a bit less persistent (more negative coefficient on U(-1)).

Table 5

Dependent Variable: U-U(-1)

	Recovery		Spurt	
Variable	Coefficient	t-Statistic	Coefficient	t-Statistic
C	0.279	1.415	0.483	3.334
G(-1)	-0.024	-1.995	-0.030	-3.971
G(-2)	-0.003	-0.274	-0.019	-2.284
U(-1)	-0.043	-1.689	-0.085	-4.016
U(-1)-U(-2)	0.351	2.837	-0.216	-1.447
R-squared	0.540		0.472	
Adjusted R-squared	0.499		0.388	
S.E. of regression	0.230		0.083	

[5] Adding more variables to the VAR increases predictability of GDP growth hardly at all.

[6] This is not just an artifact of the fact that this is a period of falling unemployment since that effect is absorbed into the constant. However, long term trends in levels of growth and unemployment do cause

An interpretation of these statistical features is that the recovery is mostly about putting former employees back to work and restoring operations as they were prior to the recession. In this recovery phase, firms apparently have in place a multi-period rehiring plan that is not much affected by quarter-to-quarter variability in realized sales growth. Expressed differently, firms during the recovery have the reasonable expectation that the recovery will continue and the quarter-to-quarter variability in sales growth has little effect on that expectation. In the growth spurt that occurs later, firms are expanding operations to levels not previously experienced, and their employment decisions are made on a quarter-by-quarter basis that depends much on whether or not sales growth is occurring. In this phase, current sales or correlates thereof are a more important input into the formation of expectations about the transition into recession.

Covariates of GDP growth and Unemployment

Next I display graphs of several other macro economic time series that reveal key features of the life cycle of the expansions. These series include investment, government expenditures, interest rates, inflation, consumer durables and nondurables, housing starts, equity appreciation, crude oil prices and information-technology investment. This is a Sherlock Holmes fact-gathering exercise. One goal is to explain why there were the growth spurts and the sputter highlighted in Table 2. Thus the eye should focus especially on the beginning of the spurts: **Kennedy/Johnson Q14, Reagan Q18 and Bush/Clinton Q21**. An equally important focus is the end of each expansion, thus looking for the early warning signs of a slip into recession.

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interpretative difficulties since the statistical analysis is based on comparisons across expansions as well as within expansions.

Investment: Businesses rush out to pick the low-hanging fruit at the beginning of an expansion

Investment is the component of GDP with the greatest volatility and is a primary driver of every expansion. Business investment opportunities are created by depreciation of old assets and by technological innovations. Relatively slow rates of investment during an economic slowdown leave many of these opportunities "on the tree", ready for a quick harvesting when an expansion begins. **Figure 6** is one measure of the state of investment opportunities. This figure depicts the deviation from trend of the capital per worker where the capital stock is computed from mostly recent investments.[7]

Figure 6

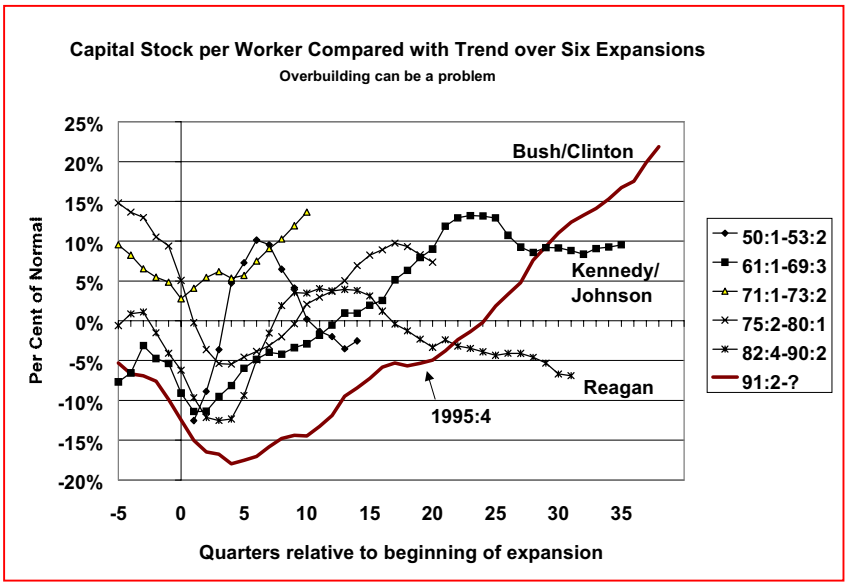


Figure 6 reveals that low rates of investment in the recession preceding an expansion generally leave the capital stock below trend early in an expansion and create cyclical investment opportunities that are mostly taken off the tree during the recovery period. An investment surge occurs coincidentally with the Kennedy/Johnson and the Bush/Clinton expansions, thus scoring a two-out-of-three success rate for the theory that it is investment opportunities that create the spurt. The Reagan expansion is quite different,

[7] The capital stock is computed from the real investment series using a very high rate of depreciation of 25% per quarter: K(t) = .75*K(t-1) + Investment(t). The deviation from tend is found by the regression log(K/worker) = a + b time.

with slowing investment beginning in Q 10 and anemic investment at, during, and after the spurt in Q 18.[8] Thus we will need to look elsewhere for an understanding of the Reagan expansion. If not investment, what component of GDP was the driver?

The Bush/Clinton expansion is a sequel to the Reagan expansion, which ended with low rates of investment premised presumably on the widespread belief that the US was a mature economy with ever slowing rates of growth and very few investment opportunities. Five quarters into the Bush/Clinton expansion the capital stock bottomed out, 18% below its long-run trend. Slow but steady investment during the first 20 quarters brought the capital stock to within 5% of its long term trend. Then, early in 1996, businesses discovered the investment opportunities afforded by the Internet and the communication devices of the New Economy. Investment particularly in information technology took off in a big way. This is the most important explanation for the second wind of the Bush/Clinton expansion.

But these high rates of investment since 1996 have driven the capital stock to 22% above trend in the third quarter of 2000. Now we are in a difficult reassessment period. If the investment opportunities afforded by the New Economy have real payoff, there is no problem with a new and higher level of capital per worker. But if, as seems to be happening, these investments are not producing the promised profits, then we are seriously overbuilt with few investment opportunities left.

> The slowdown, however, has done nothing so far to stop the binge of auto factory construction. Toyota opened a factory in Princeton, Ind., last year and DaimlerChrysler is about to open one in Toledo, Ohio. Honda and Mercedes recently announced the construction of new factories in Alabama while Nissan said last month that it would erect an assembly plant in Mississippi. All of these factories will build sport utility vehicles, pickups or minivans, which will probably result in surplus production in market segments that had been the industry's most profitable.
>
> New York Times, December 2, 2000
> Automakers are Facing a Sales Slowdown By KEITH BRADSHER

Government: The Congress can keep an expansion going, or make it stop

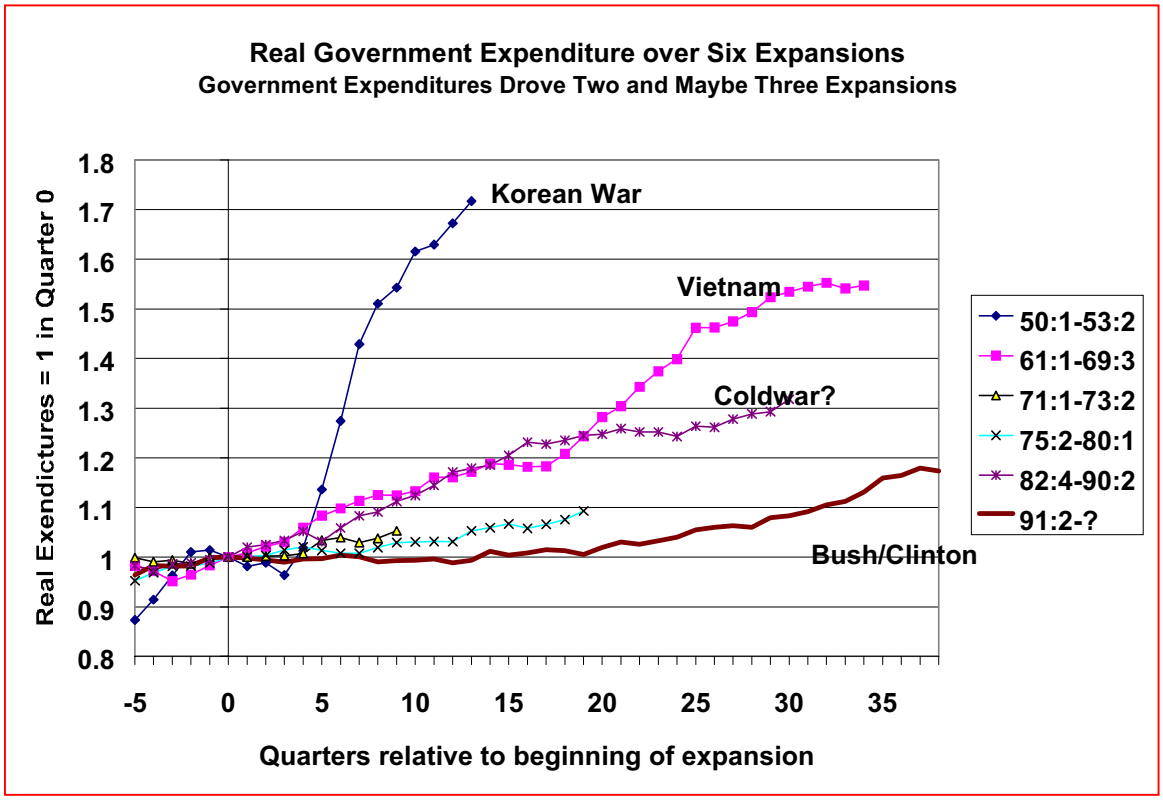
Although investment is the proximate cause for the Kennedy/Johnson and the Bush/Clinton spurts, we need to find what caused the rise in investment. One possibility is government expenditures. When

[8] The share of investment in GDP was 19% percent at the end of the Reagan recovery but fell to 16% during the Reagan spurt

the normal opportunities have been exhausted, major new government expenditure programs can reveal whole new orchards with new low hanging fruit and can drive an expansion on. Figure 7 shows that government expenditures during the Vietnam War may have pushed the Kennedy/Johnson expansion from potential termination after 16 quarters to a full life of 35 quarters. The timing isn't perfect, however, since the Kennedy/Johnson spurt began in Q 14, while the ramp-up in government expenditures doesn't begin until Q18. The timing more accurately supports the conclusion that the Vietnam War allowed the Kennedy/Johnson final plateau to be 14 quarters in length, compared with only 5 for the Reagan expansion and, so far, only 2 for the Bush/Clinton expansion. The leveling of government expenditures in the last four quarters presumably contributed to the termination of the Kennedy/Johnson expansion.

Expenditures on the Korean war appear to have been a major driver of the Truman expansion. The Reagan military buildup occurred prior to 1985 and created investment opportunities in the first 15 quarters of the expansion, but cannot account for the Reagan spurt and the long life of the Reagan expansion. Government has not been part of the story during the Bush/Clinton expansion.

Figure 7



Monetary Policy: The Federal Reserve Board Can Keep an Expansion going, or make it stop

The Federal Reserve Board, which usually attempts to contribute to the start of an expansion with an infusion of credit into the system, can temporarily keep the expansion going with another injection of credit, but too much of this can encourage overpicking and can set off an inflationary spiral that can kill the whole tree. The interest rate measure which best tracks the life cycle of an expansion is the spread between the 10 year Treasury Bond and the 3 month Treasury Bill depicted in **Figure 8**.[9] When this spread is great, banks make substantial intermediation profits by accepting short term deposits and making long-term loans. When this spread is small, banks have to be very careful to make loans to only the most credit-worthy borrowers since each transaction doesn't come with a pure intermediation margin. When the spread turns negative for an extended period of time, this can create serious banking problems and even the Savings and Loan crisis, in late 1979 and 1980.

Incidentally, in using the spread as an indicator of monetary policy I recognize that only the short term rate is under substantial control by the Fed, and that some significant movement in the spread comes from the bond market's assessment of future inflation risks and the capital gains/losses from future changes in the long term rates. These fundamentals dictate a narrowing of the spread over the expansion, but that narrowing can be punctuated by substantial short-term change in the spread caused by Fed interventions. Regardless of the source of variation, the spread is a measure of bank intermediation. Regardless of the source of variation, this is the interest measure that best tracks the life cycle of an expansion.

[9] This is the variable used in a series of papers by Estrella and coauthors. See the appendix for a graph of the real interest rate which does not track the life of the expansion in a very clear way.

Figure 8

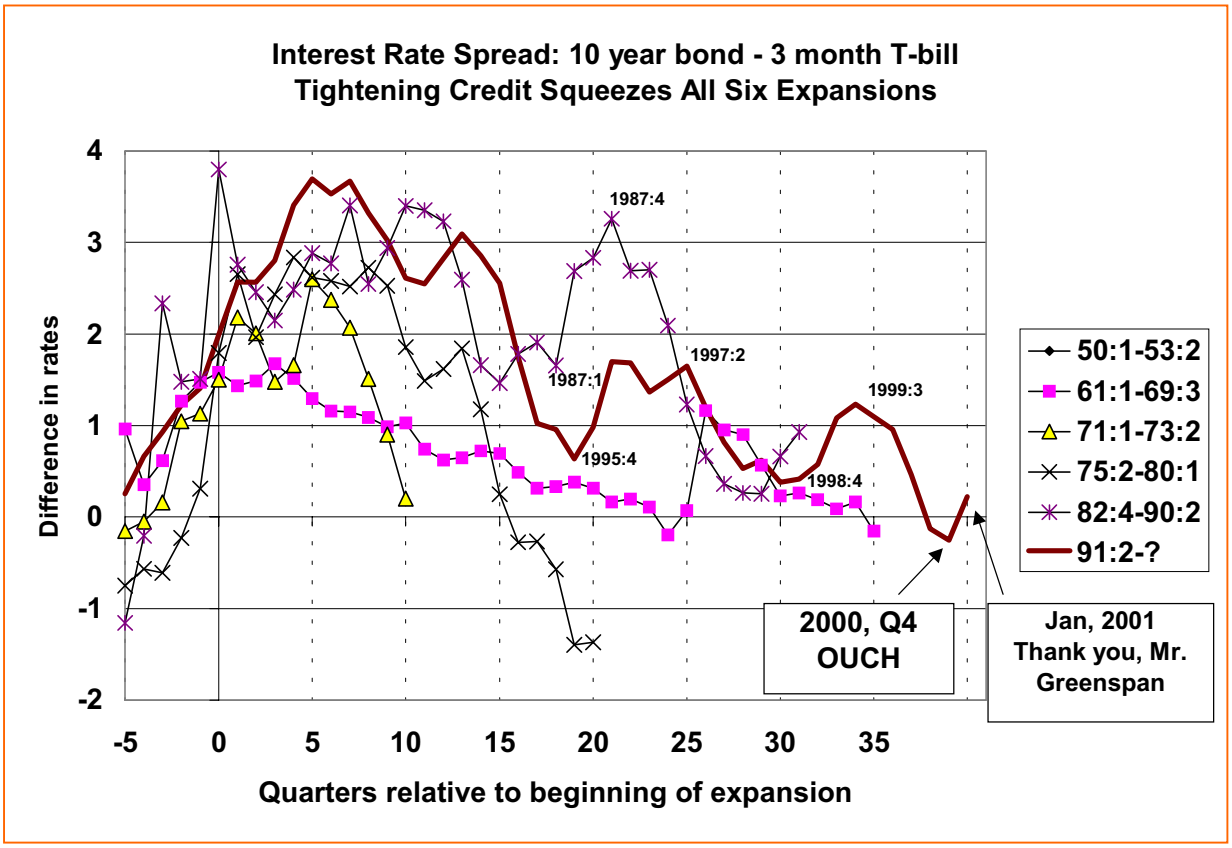


Figure 8 reveals a substantial role of the Federal Reserve Board in our economic expansions. Credit tightness in the slowdown preceding an expansion is rapidly reversed with substantial injections of liquidity early in the expansion. This increases the spread between the long and short rates to 300 basis points or more after 5 quarters. Inevitably, this spread narrows and credit tightness helps to pinch off an expansion. Offsetting this general tendency toward tighter credit are occasional injections of liquidity. The Reagan spurt in Q18 coincides almost exactly with a 100 basis point increase in the interest rate spread in Q19, to a level characteristic of the early phases of an expansion. As we discussed above, this didn't cause an increase in investment, and if this is the reason for the Reagan spurt we need to find which components of GDP responded to monetary policy. More on this puzzle below, when we look at consumer durables and non-durables.

With the increase in credit in Reagan Q19 came a slight increase in the rate of inflation, illustrated in **Figure 9.** Here we see that inflation is tame in the early phases of an expansion, and seems to come

back a bit toward the end. But the huge burst of inflation in the later half of the Kennedy/Johnson expansion may linger in Fed memories, making them wary of expansionist monetary policies, especially since it is closely timed with an increase in credit in Kennedy/Johnson Q26 displayed in **Figure 8**. This was a failed attempt to create a second spurt and it only created inflation. The slight rise of inflation beginning in Q 15 of the Reagan expansion probably contributed to Fed caution and monetary tightening in Reagan Q21 (1987 Q4). By the time the Fed shifted direction at the end of 1989 and allowed the interest rate spread to increase, it was too little and too late, and the Reagan expansion ended in the second quarter of 1990, much to the chagrin of George Bush, who had to seek his second term as President with a troublesome recession in the background.

The changing behavior of the Fed seems evident in the path of the interest rate spread over these expansions and from the major changes that are displayed in Table 6. In the Kennedy/Johnson expansion, the spread maximized at 170 basis points, and very steadily declined, except for the sharp increase to 120 basis points in 1967Q2. The replacement of William McChesney Martin, Jr. with Arthur F. Burns in 1970 seemed to precipitate a more interventionist Fed determined to influence the life cycle of the expansions. Arthur Burns and his successors, William Miller and Paul Volcker allowed the Nixon and the Ford/Carter recoveries to be supported by spreads exceeding 300 basis points, but also let the spread drop precipitously even going to –140 basis points in the last quarter of the Ford/Carter expansion. Correctly or incorrectly, the Fed was implicated in the early deaths of those two expansions. Mr. Volcker, who took over the helm when the ship was already headed for the shoals in August of 1979, subsequently charted a new course wavering between the routes chosen by McMartin and Burns. Like Burns, Volcker supported the Reagan recovery with spreads exceeding three hundred basis points, but he would fight against the natural drop in the spread with a massive McMartin-style injection of liquidity in 1987. When the new captain, Alan Greenspan, took over the helm in the 1987 Q3, he remembered the rise of inflation that came with the McMartin injection of liquidity, and he reverted to the Burns style, letting the spread drop tremendously by over 300 basis points in the two-year interval from 1987 Q4 to 1989 Q4. By the time he changed his mind, and yanked the rudder in the opposite McMartin-direction, he couldn't stop the recession, which began in 1990 Q3. Again the Fed was implicated, rightly or wrongly, in the death of an expansion. Mr. Greenspan would get a second chance, which he would make the most of. Learning from the apparent errors of the

past, he would use more frequent but smaller changes in course. Indeed, of the eleven monetary events since 1960 that are identified in Table 6, six have been Greenspan's. With the exception of the credit injection in 1996, the monetary events engineered by Mr. Greenspan have been rather small reversals as measured by the change in the spread per quarter. . Now in the first quarter of 2001, the Fed has done a rapid about face, completely reversing in a single month the 100 basis point increase in the Federal Funds rate early in 2000. I speculate that late at night on January 2, Mr Greenspan was visited by the ghost of recessions past, and visited the FOMC meeting run by William McChesney Martin back in January of 1967. But if we do enter a recession, or experience a significant slowdown as seems almost certain, the Fed again will be implicated, rightly or wrongly, because of its behavior in 2000.

Table 6

Major Changes in the Spread Excepting the Rise in the Spread in the Recovery

Monetary Expansions

				Expansion Quarter			Basis Points	Change per Q
		Year	Q	Begin	End	Total		
Kennedy/Johnson	McMartin	1967	1	25	26	1	136	136
Reagan	Volcker	1987	2	19	21	2	160	80
Bush/Clinton	Greenspan	1996	1	20	21	1	107	107
Bush/Clinton	Greenspan	1998	4	31	34	3	85	28

Monetary Contractions

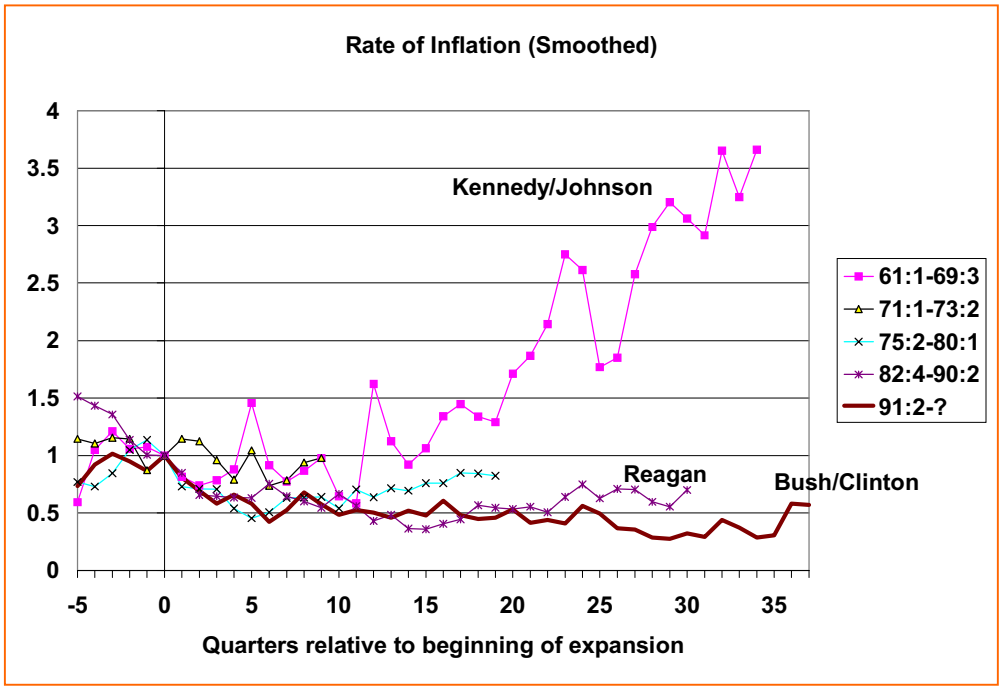
				Expansion Quarter			Basis Points	Change per Q
		Year	Q	Begin	End	Total		
Nixon	Burns	1972	2	6	10+1	5	-371	-74
Ford/Carter	Burns/Miller	1977	2	9	20	11	-409	-37
Reagan	Volcker	1985	2	11	15	4	-194	-49
Reagan	Greenspan	1988	1	22	29	7	-300	-43
Bush/Clinton	Greenspan	1994	3	14	19	5	-246	-49
Bush/Clinton	Greenspan	1997	3	26	30	4	-127	-32
Bush/Clinton	Greenspan	1999	4	35	38	3	-136	-45

The Clinton expansion has apparently been extended by two injections of liquidity, once in early 1996 and again in early 1999. In the fourth quarter of 2000, the spread between the long term and short term rates turned negative, and banks were feeling the pinch and running from risk. In December of last

year, I wrote "Inflation has increased just a bit, though perhaps not enough to keep the Fed from a rescue injection of liquidity early in 2001." Indeed the 100 basis point reduction of the Federal Funds rates in two installments in January did correct the interest rate inversion, but the spread remains only slightly positive. Today the Fed sits between a rock and a hard place with the economy offering both slower growth and higher inflation the first calling for another 100 basis point cut in the Federal Funds rate, and the second calling for caution.

The orchards model also offers another cautionary note: if the Fed encourages businesses to climb higher into the trees to pick the investment opportunities, the recessionary quiet time when the trees fill with fruit will be all the longer. Better to call a time out now, and let the overinvestment in information technology and Internet ideas and automobiles and other consumer durables correct itself. According to the orchard model, it wasn't monetary policy that has driven the Bush/Clinton expansion – it was the discovery in 1996 of the vast orchard of Internet investment opportunities and the headlong rush by almost every business in the US to have an Internet presence. What we need today is not lower interest rates and more picking; we need some new technology to create a new burst of investment opportunities. Or we need some quiet time.

Figure 9



Monetary Policy stimulates Consumer Nondurable Spending

If monetary policy matters, why? As can be seen in **Figure 6**, there was no apparent effect on investment of the expansionist monetary policy in the 18th and 19th quarters of the Reagan expansion and the 25th and 26th quarter of the Kennedy/Johnson expansion. That's a surprise, isn't it? If not investment, what component of GDP is stimulated by monetary policy? It must be consumer durables, especially automobiles, you are probably thinking. Wrong again; it is consumer nondurables, not durables. As can be seen in **Figure 10** and **Figure 11**, following the expansionist monetary policy in the Kennedy/Johnson expansion, there was a surge in both consumer durables and nondurables. This coincided also with a big increase in government spending, which detracts from the claim that monetary policy had an effect in that expansion. In the more pure monetary experiment in the 18th quarter of the Reagan expansion, consumer durable spending remained flat while nondurables surged. This leads me tentatively to the conclusion that monetary policy cannot create enough confidence in the future to encourage businesses to make investment commitments, or even to get consumers to buy durables. The cheaper credit supports expenditures on consumer nondurables. The apparent absence of an interest effect on investment or even consumer durables is good news since it means that the Fed is not encouraging over-picking of the investment opportunities, which may not mean an extended recession later on.

Figure 10

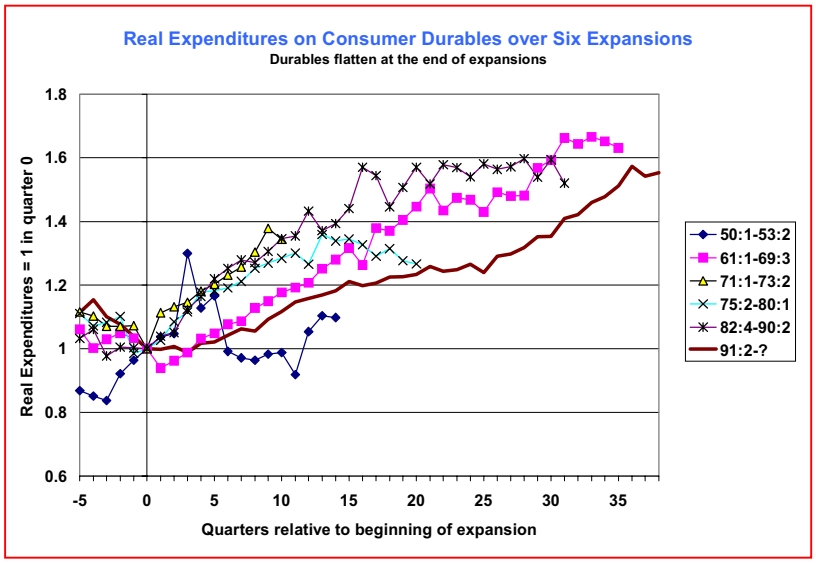
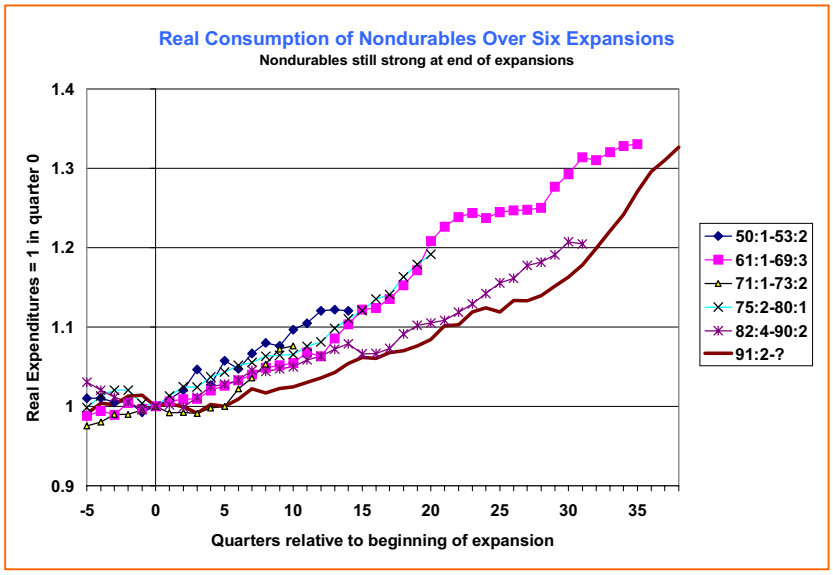


Figure 11

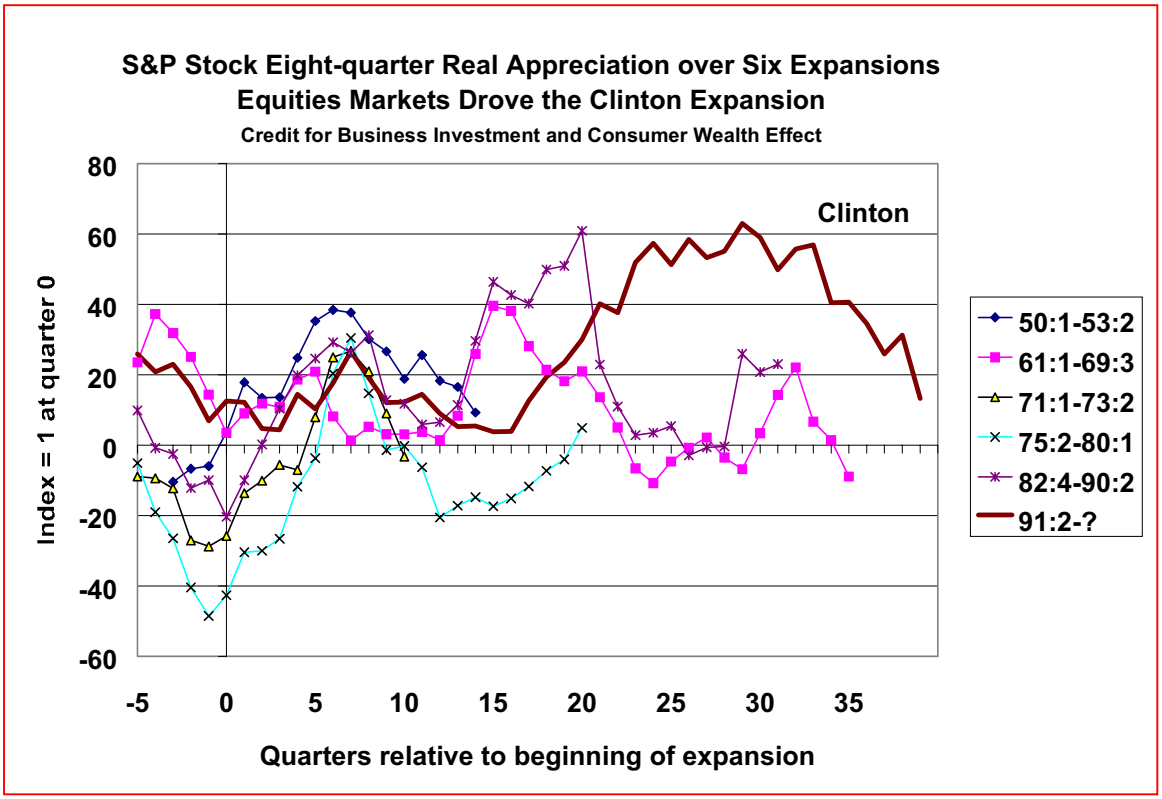


During the last five years of the Bush/Clinton expansion there has been a consumption boom, particularly in nondurables. This boom does not follow the ups and downs of the interest spread, and may not have much to do with monetary policy. Indeed, I think it is equities markets, not bond markets where we should look to understand the Bush/Clinton spurt and the second plateau.

Equities Markets: Appreciation of equities can keep an expansion going

A central feature of the last five years of the Bush/Clinton expansion has been the role of equities both as a source of capital to support business investments and a source of wealth to support consumer purchases of durables and nondurables. **Figure 12** is the 8-quarter appreciation of the Standard and Poors 500 stock index minus the rate of inflation. This interval of eight quarters is somewhat arbitrarily chosen to approximate the memory capacity of many investors. This figure excludes dividends which added significantly to the return on equities in the 1960s and much less so over time.

Figure 12



This figure indicates that equity markets offer high returns during the recovery and the spurt, but do less well during the two plateaus and poorly during the recessions. The Bush/Clinton equity appreciation was modest during the recovery and first plateau, but was very high and very sustained over the spurt. The extraordinary behavior of equity markets from quarters 20 to 30 of the Bush/Clinton expansion suspended the normal rules for harvesting investment opportunities. It didn't much matter where the fruit was hanging, as employees, venture capitalists and equity investors scrambled headlong to pull the Internet fruit off the tree and sell the harvest to the equity markets at incredible prices. Too bad the Internet fruit turned out pulpy and juiceless. The much-heralded first mover advantage applied not at all to Internet presence but only to access to the capital markets. Those who waited to 2001 for their IPOs will never be Dot-com millionaires.

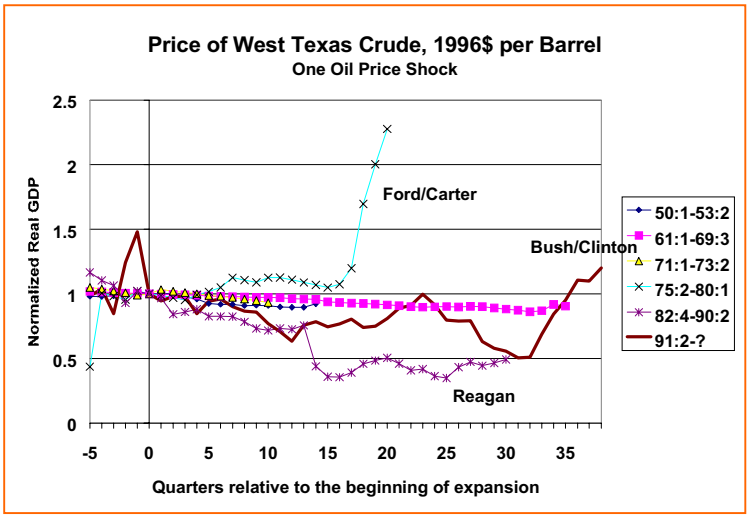
The direction of the equities markets at quarter 39 of the Bush/Clinton expansion is decidedly down, and we cannot expect help from the equities markets to sustain this expansion. Indeed it is unlikely

that in our lifetime we will ever experience an equities market that is as strong as the last five years of the Bush/Clinton expansion.

Energy Prices: Shocks Sometimes Matter

The life of an expansion can be interrupted by energy price shocks as is suggested by the crude oil price data displayed in Figure 13. The Ford/Carter expansion appears to have been terminated after only 20 quarters by a sharp rise in crude oil prices. The Reagan expansion benefited from a sharp drop in energy prices prior to its growth spurt. Indeed, this competes with monetary policy as an explanation for the long life of the Reagan expansion. The Bush/Clinton growth spurt was also closely timed with a fall in energy prices. These observations should make one worry about the consequences of the run-up in energy prices since quarter 32 of the Bush/Clinton expansion.

Figure 13



Technology: American inventors can keep an expansion going

Bursts of technology can also reveal whole new orchards of business investment opportunities with new low hanging fruit. The electric motor and internal combustion engine, with all of their many applications, drove the expansion of the 1920s, as did the Internet in the 1990s. Inevitably, newly discovered orchards are picked clean too, and the expansion has to terminate for the same reasons.

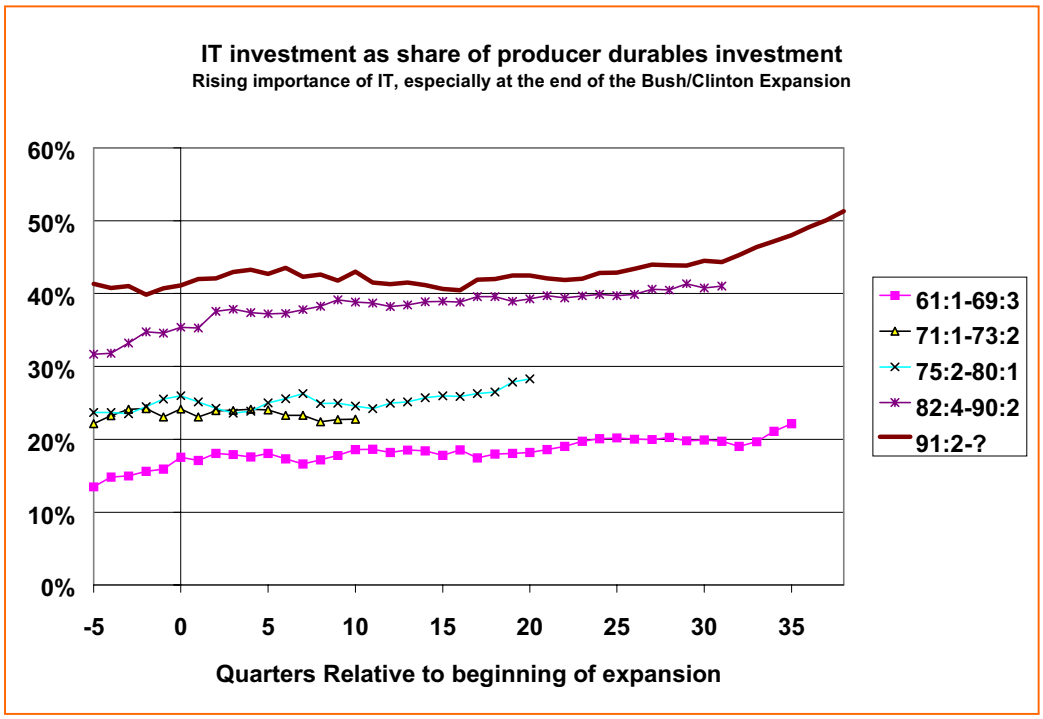
The Bush/Clinton expansion has been a major beneficiary of the Internet and wireless communication, which have created myriad new investment opportunities starting in 1995. A symptom of the role that the Internet played was the rising share of computers and information technology in producer durables, even as the level of investment overall was surging. Figure 14 shows the very significant long-term trend in IT investment as a share of producer durables. This share was stable at about 42% through the first half of the Bush/Clinton expansion but rose dramatically starting about the 30th quarter to a level of 52% in the 38th quarter.

Businesses today are substantially reassessing their Internet commitments, having realized a bit too late that it takes space to protect profits from being competed away by close neighbors. Space can come from bricks and mortar locational assets, from patent protection, from brand equity and from a nontransparent business model. None of these is present on the Internet. There is no there there. Firms do not have a neighborhood location advantage. Every firm is only a click away. That creates a tough environment in which to create brand equity. Patent protection of the Internet intellectual property like one-click shopping is difficult to obtain. Worst of all, a business model embodied in a website is completely transparent.

I think that the New Economy can be thought to offer three kinds of innovations: e-markets, e-delivery and e-communications. I am highly doubtful that we will see the emergence of significant numbers of e-markets. A market is a metaphor for a place where countless, faceless buyers and sellers meet to conduct transactions. Once the transaction is completed, there is no need ever again to connect that specific buyer with that specific seller. But there are very few transactions that are mediated by markets. Almost all transactions are supported by long-term relationships that create the trust and the context that allow a buyer to understand and to believe the claims of the seller. There is no reason to suppose that the Internet reduces the need for long-term relationships. Secondly, there is e-delivery of information. As a system for the delivery of information, the very efficiency of the New Economy pardoxically by allowing virtually costless sharing destroys the incentive to create the content. Who will create the music for Napster to distribute? It is thus not e-markets or e-delivery that will be the lasting business tools of the New Economy. It is e-communications. The cell phone, voice mail, e-mail, the

beeper and the Palm Pilot allow knowledge workers to work virtually around the clock and to fill what would otherwise be unproductive downtown, like commuting, with productive communcation.

Figure 14



The good news and the bad news.

The golden lining of this news is that Americans didn't really see all the Internet opportunities, and we allowed foreigners, especially Europeans, to pay for most of the ladders. **Figure 15** displays the capital inflow as a share of GDP and **Figure 16** the savings rate as a share of GDP. Keep in mind that investment is the sum of these. Thus during the initial two years of the Bush/Clinton spurt, the increase in investment was financed from an increase in our own savings while the capital inflow was steady at around 1½ per cent of GDP. But starting in Q26 in the second half of 1997, US savings leveled off and then declined down to 14% of GDP. In this period the rise in investment was more than completely financed by the capital inflow.

Had we financed the Internet boom with bonds issued by viable American companies, we would be deeply in debt to Europe today, but we wisely issued them worthless equities, and these Europeans will never get their money back since the first attempt at wholesale cashing in will bring a double deterioration in their value: a crash in their valuation denominated in dollars, and a crash in the value of the dollar.

On the other hand, we made a mistake by imagining that a sucker is born every minute and thus to suppose that the appreciation of our own equities that has been driven by European investment would go on forever. Based on that optimistic view, we have gone on a consumption binge. It would have been better in the long run to trade our worthless dot.com equities for equities and bonds issued by real European companies. But instead of buying Daimler-Benz, we bought Mercedes SUVs.

Thus the bad news is that we may have to adjust painfully to a new lifestyle that is no longer being paid for by issuing worthless paper to unsuspecting Europeans. This adjustment could require a relatively long and deep recession. We have experienced an adjustment to a substantial external imbalance during the Reagan expansion when the capital inflow rose to a level in excess of 3% of GDP. There is an important difference between then and now however. Then it was bonds, today it is equities.

Speed of equlibration is the key. If the speed is slow, then we can correct the external imbalance with a slow and steady increase in exports. But exports respond too slowly for a rapid equilibration. Then it is imports that have to do the job, which would now call for a $400 billion reduction in imports, which can only be accomplished with an income effect and a price effect - the price effect through higher prices for imports caused by a depreciating dollar and the corresponding rise in inflation, and the income effect through a couple of quarters of negative GDP growth.

When it was bond markets that drove the dollar, the speed of reequilibration is largely under the control of the Fed although the conduct of monetary policy can be pulled in two different directions – higher interest rates to support the dollar and attract the capital, but lower interest rates to fight off a looming recession. In the Reagan expansion, the capital inflow was mostly Treasury Bonds purchased by the Japanese, and the reequilibration of the external accounts from Q20 to Q31 was slow allowing a ramp-up of exports not a sharp drop in imports. The speed of adjustment was much under the control of the Fed, which encouraged the Japanese to continue buying our bonds with high nominal and high real interest rates.

Indeed, monetary tightness after 1987 was doubtlessly partly intended to support the dollar and to fight the inflation that a depreciating dollar would engender, even though it might have also brought on a recession.

Now when the capital inflow is mostly directed at the equities markets, the Fed has a much greater control problem. Most optimistically, lower interest rates both keep the economy humming and also drive up the dollar by making US equities more attractive. Less optimistically, the dollar is destined to decline as foreigners lose interest in US equities, regardless of what the Fed may do. Thus the role of equity markets both in the financing of the New Economy also as the instrument of choice for foreign investors, may make the Fed relatively powerless today.

Figure 15

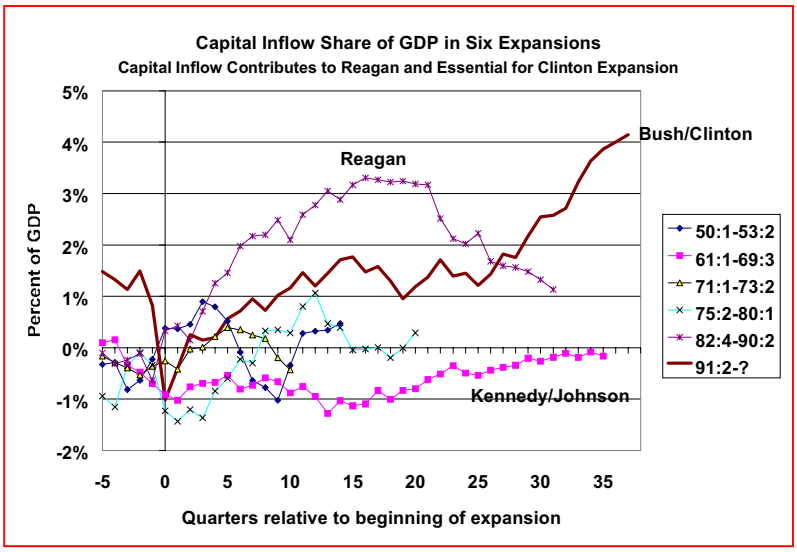
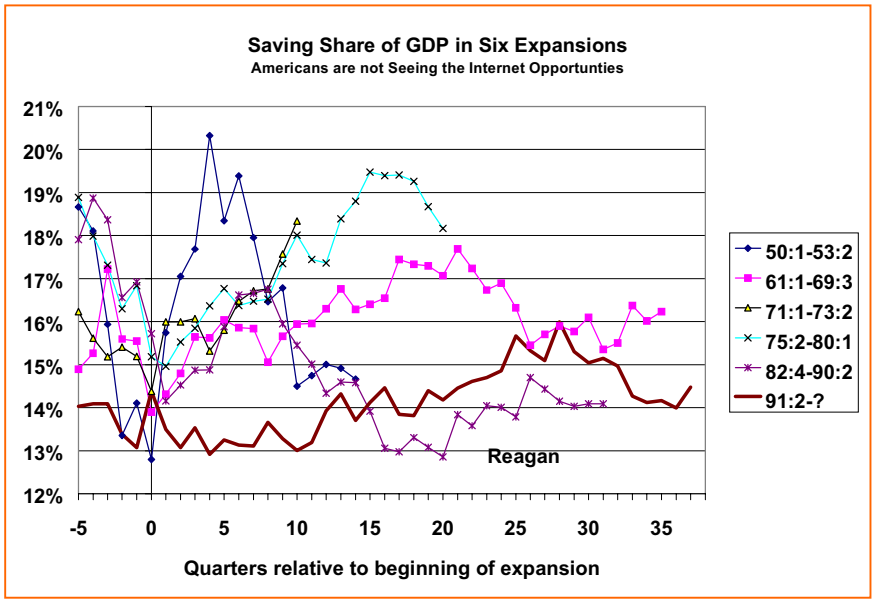


Figure 16



It is easy to predict that an expansion will end, but it is much more difficult to predict when.

While the evidence about the limited lives of business expansions is considerably less than the evidence regarding the finiteness of human life (there are more human trials), still there has only been only one US business expansion that hasn't died☺. Although some suggest that this expansion will live virtually forever, I seriously doubt it. **Figure 17** illustrates an estimated probability of the end of an expansion in 2001 based on data through 2000 Q3 using three predictors: the unemployment rate, corporate profits relative to investment, and weekly hours in manufacturing. The formal probit estimates reported in Appendix 1 indicate that an expansion ends when unemployment is low, when profits are low compared with investment rates, and hours are short. [10]

[10] Estrella and Mishkin(1989) also use a probit model to predict recessions but their model asks the question: "Are conditions present today which would make one think that the economy will be in recession in k quarters?" My question is: "Are conditions present today which would make one think that a recession will begin within the next four quarters?" Here is a graph that contrasts the periods that I identify with the Estrella/Mishkin periods:

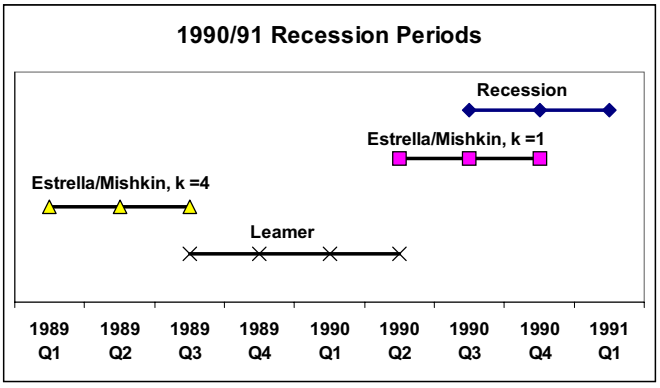
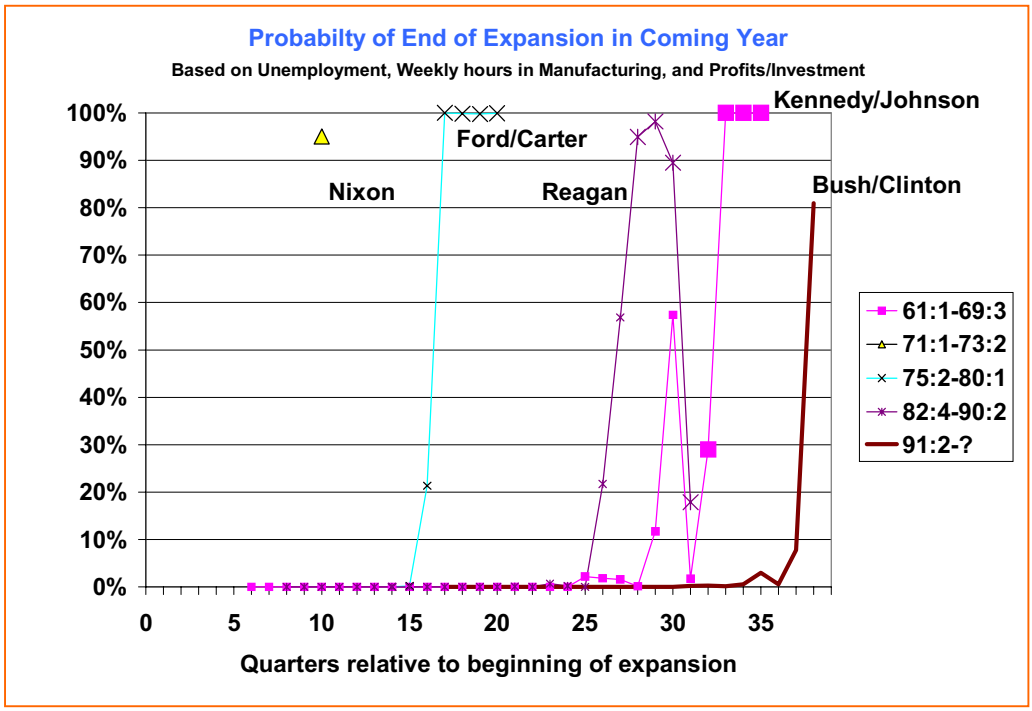


Figure 17



Without resorting to econometric jargon, suffice it to say is that, with the assistance of a computer, I have searched for variables that help to distinguish the final four quarters from the post-recovery quarters of the last four expansions, and I have asked if these same conditions are present during the Bush/Clinton post-recovery period. This model implies the predicted probabilities reported in **Figure 17,** where I use enlarged markers to identify the four quarters at the end of each expansion which are the target of the estimating equation. A perfect fit would have all the large markers at 100% and all the others at zero. It's pretty close to this, and has a McFadden R^2 of 0.84. The model doesn't seem to catch the end of the Nixon expansion until the very last quarter, but this is the only post-recovery period in this expansion– the earlier data are part of the recovery, a period excluded from consideration. The model also indicates the role of the Fed at the end of the Reagan expansion in driving down the recession risk, too little and too late. But that declining probability of transition may help to explain why the 1990/91 recession was so short and shallow.

The Index of Leading Indicators Doesn't Predict the Ends of Expansions

I will make my point about the need to focus on the transitions by examining the ability of the index of leading indicators displayed in **Figure 18** to predict the ends of expansions. A probit model based on the level of the leading indicators is virtually worthless, but the model works better if both the current and the lagged indicator are included, thus making a prediction based on the change of the indicator. A probit model reported in an appendix that uses current and lagged leading indicators as explanatory variables generates the predicted transition probabilities in **Figure 19**, which should be compared with the predicted transition probabilities in **Figure 17** which is based on two of the components of the leading index. Clearly the index of leading indicators is not doing a very good job identifying the end of the four expansions. A reason for this is that the index of leading indicators is constructed to predict all the turning points, from recession to recovery, and recovery to plateau, and plateau to spurt, and spurt to plateau as well as plateau to recession. We can do better with five specialized instrument rather than one all-purpose instrument.

Figure 18

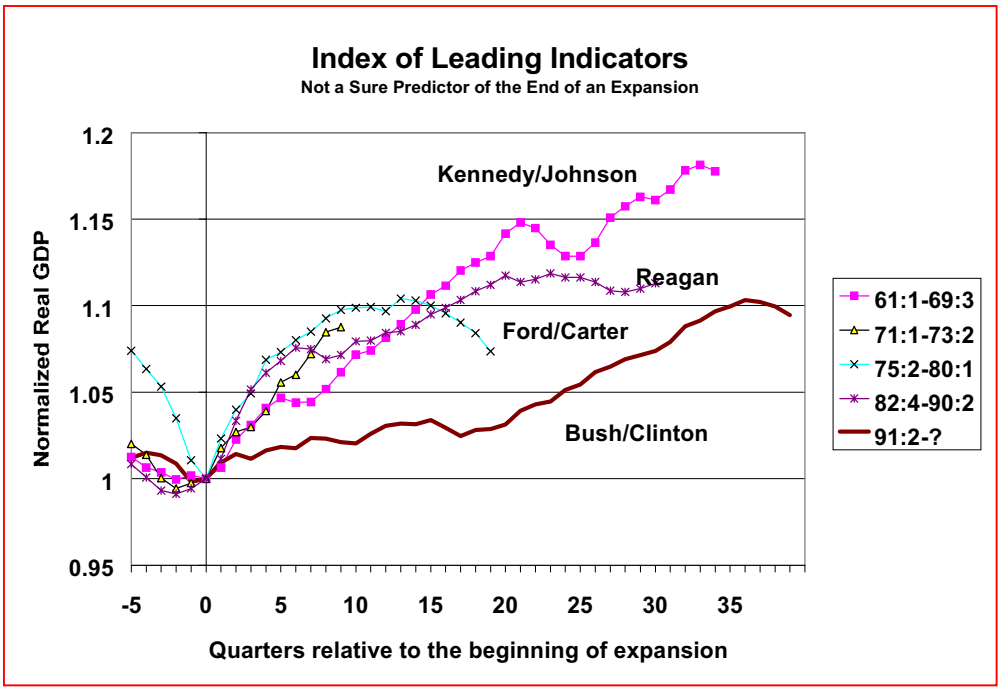
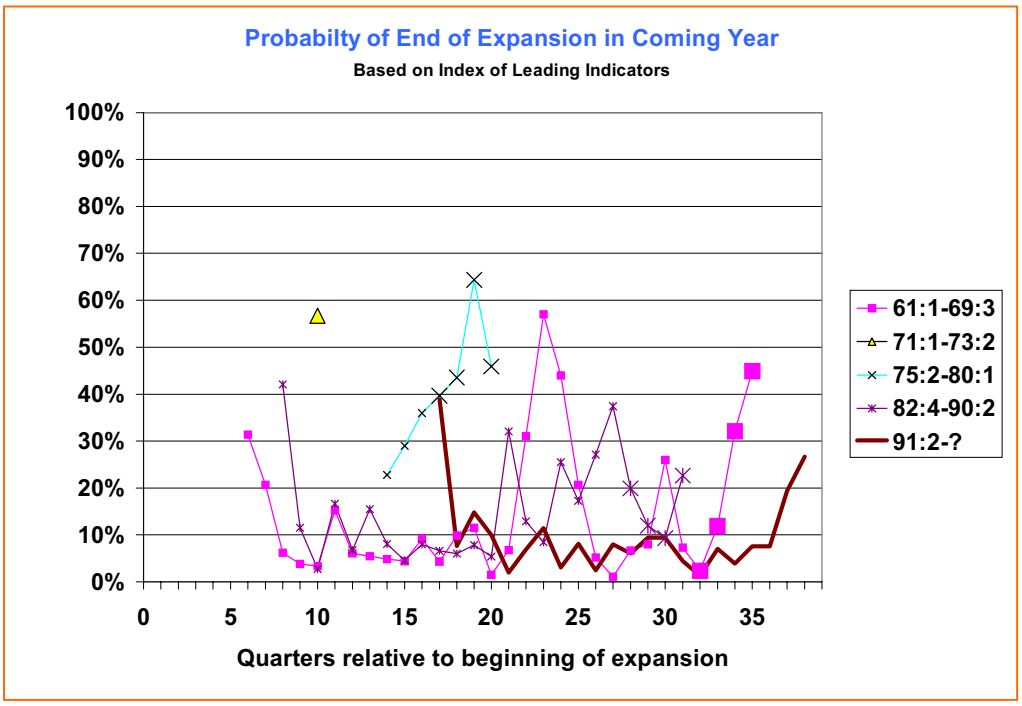


Figure 19



Those are overestimates of the probabilities

The last three probabilities of the Bush/Clinton expansion in Figure 17 are out-of-sample predictions in the sense that we do not yet know if the expansion will end as early as the first quarter of 2001, in which case the binary indicator for the last four quarters would be one for all of the year 2000. These predicted probabilities need to be viewed with some skepticism because of over-fitting issues. Even if this were the only probit model ever estimated, the estimation process works as hard as it can to fit the data perfectly, and thus identifies patterns that may not be real. There is a difference between an R^2 and an adjusted R^2. But you can be assured that the visual and numerical net was cast much wider than the three variables that ended up in the model. The extensive data mining that lies behind the estimated model can create the illusion of accuracy, since the historical data may be well tracked, but when the model is used to forecast, the results can be disappointing. This data mining may cause us to overestimate the probability of the end of the Bush/Clinton expansion. But there is also a reason why the probability might be underestimated. The equities markets are not part of the model since they have not played a demonstrable role in ending the other expansions. The collapse of equities in the last six months seems surely to have increased the probability of the end of this expansion beyond the level suggested by the unemployment, profits and interest rate data. Thus there are two forces operating in opposite direction: data mining that creates an overestimated probability of recession, and uniqueness of the Bush/Clinton expansion, which may lead us to underestimate the probability. I informally mix this together with knowledge of what is happening in the fourth quarter of 2000, and make the judgement call that the probability is 60% of the end of the Bush/Clinton expansion, sometime in 2001.

Other Transitions

To explore the idea that we need four leading indicators, each one tuned to a different task, I report in Table 7 probit estimates of five transitions, from recession to recovery, from recovery to plateau, from plateau to spurt, from spurt to plateau and from plateau to recession. In each case the period selected is the last two quarters preceding the transition from one phase to the next, and in each case the data set is confined to quarters in the first phase. Thus the probit estimates of the transition from recession to recovery is asking how the last two quarters of the recession differ from the other recession quarters. I

have highlighted in bold those indicators that help to predict a transition in the sense of having a z-statistic in excess of two. One message in this table is that these three indicators (the rate of unemployment, the ratio of profits to investment and weekly hours in manufacturing) play very different roles in predicting transitions. The onset of a recovery is signaled by increased profitability, but the end of the recovery occurs when employment has, literally, recovered. The slowing down of the economy late in an expansion, in other words the transitions from spurt to plateau and from plateau to recession, is signaled by a combination of low unemployment, weak profitability and a fall in hours in manufacturing. A second message of this table is that slowing is much more predictable than accelerating. The transition from plateau to spurt is basically unpredictable, the probit model producing a McFadden R^2 of only 0.08. The transition from recession to recovery is better with a McFadden R^2 of 0.26, but it is the spurt to the plateau and the plateau to recession in which the greatest predictability occurs.

Table 7

Probit Models of Transitions

	Recession to Recovery		Recovery to Plateau		Plateau to Spurt		Spurt to Plateau		Plateau to Recession	
	Coeff	z-Stat	Coeff	z-Stat	Coeff	z-Stat	Coeff	z-Stat	Coeff	z-Stat
Unemploy Rate	0.51	1.47	-0.78	**-2.51**	0.38	0.54	-4.18	-1.88	-1.85	**-2.47**
Profits/Invest	8.48	**2.09**	-2.35	-0.60	3.65	0.95	-13.70	-1.60	-21.85	**-2.42**
Hours	-0.50	-0.66	0.29	0.82	0.78	1.17	-5.69	-1.64	-1.65	-1.74
Total obs		30		49		31		34		51
% with Dep=1		0.33		0.20		0.19		0.18		0.14
McFadden R-sq		0.26		0.23		0.08		0.34		0.44

Concluding Comments

If this paper adds value to the conversation about the course of the US economy, it is because of my reliance on graphical displays that help to identify features of the data that are not revealed by numerical processing. For data analysts, the New Economy changes our intellectual lives for three reasons: first there has been an extraordinary increase in access to numerical information over the Internet, second there has been an important increase in numerical processing speeds, and, third, there has been a great reduction in the time and money costs of creating visual displays. I think access and visual displays are far more important recently than speed of numerical processing. My need to have a near-instantaneous

display of the probit estimates was more or less fully satisfied a decade ago, and the increasing megahertz of PCs doesn't have significant value for numerical processing. The increasing automation of visual displays is a different story, which is the basis for this paper.

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Appendix: Presidents and Fed Chairmen

Presidents of the United States	Start Year
Harry S Truman	1945
Dwight David Eisenhower	1953
John Fitzgerald Kennedy	1961
Lyndon Baines Johnson	1963
Richard Milhous Nixon	1969
Gerald Rudolph Ford	1974
James Earl Carter	1977
Ronald Wilson Reagan	1981
George Herbert Walker Bush	1989
William Jefferson Clinton	1993
George W. Bush	2001

Chairmen of the Federal Reserve	Start Date
Thomas B. McCabe	Apr. 15, 1948
Wm. McC. Martin, Jr.	Apr. 2, 1951
Arthur F. Burns	Feb. 1, 1970
G. William Miller	Mar. 8, 1978
Paul A. Volcker	Aug. 6, 1979
Alan Greenspan	Aug. 11, 1987

Appendix: Equations for predicting the end of expansions

Dependent Variable: END4
Method: ML - Binary Probit
Date: 02/18/01 Time: 13:19
Sample(adjusted): 1962:2 1999:4 IF PHASE>1.1
Included observations: 81 after adjusting endpoints
Convergence achieved after 11 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	349.3297	137.4397	2.541694	0.0110
U	-5.833695	2.493263	-2.339783	0.0193
PROFITS/INVEST	-57.34707	22.79768	-2.515479	0.0119
HOURS_WEEKLY	-7.130661	2.867741	-2.486508	0.0129

Mean dependent var	0.160494	S.D. dependent var	0.369350
S.E. of regression	0.159438	Akaike info criterion	0.237858
Sum squared resid	1.957388	Schwarz criterion	0.356102
Log likelihood	-5.633241	Hannan-Quinn criter.	0.285299
Restr. log likelihood	-35.67952	Avg. log likelihood	-0.069546
LR statistic (3 df)	60.09255	McFadden R-squared	0.842116
Probability(LR stat)	5.62E-13		
Obs with Dep=1	68	Total obs	81
Obs with Dep=0	13		

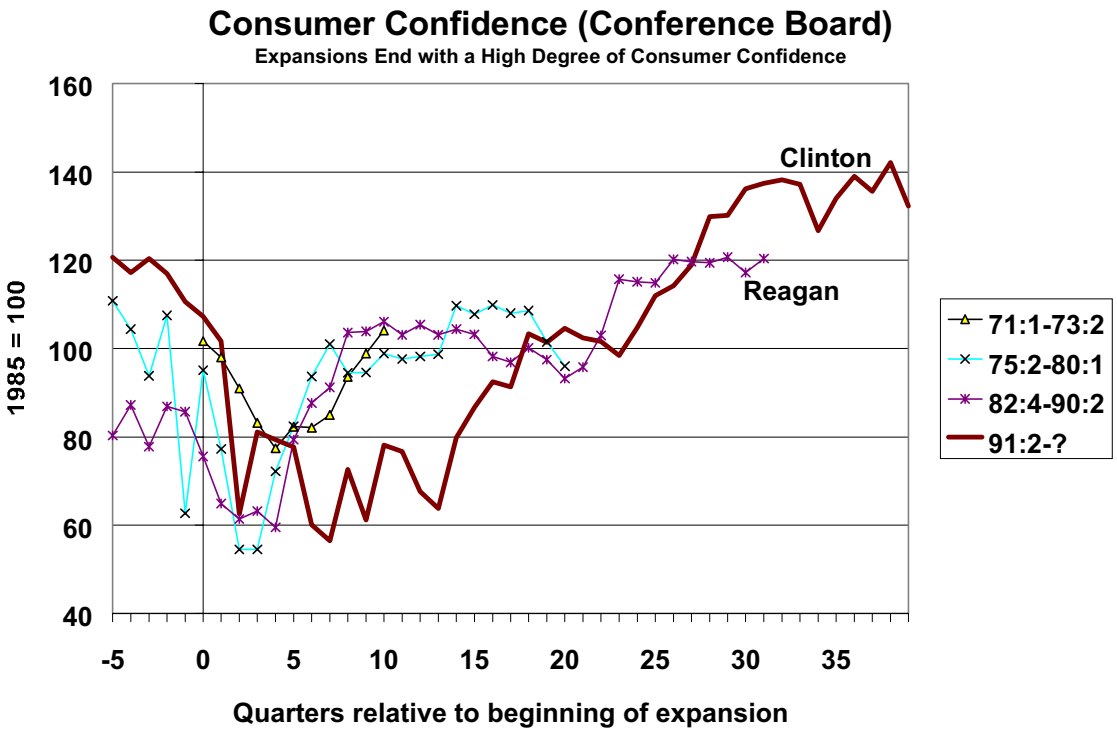
Dependent Variable: END4
Method: ML - Binary Probit
Date: 02/19/01 Time: 13:57
Sample(adjusted): 1962:2 1999:4 IF PHASE>1.1
Included observations: 81 after adjusting endpoints
Convergence achieved after 9 iterations
Covariance matrix computed using second derivatives

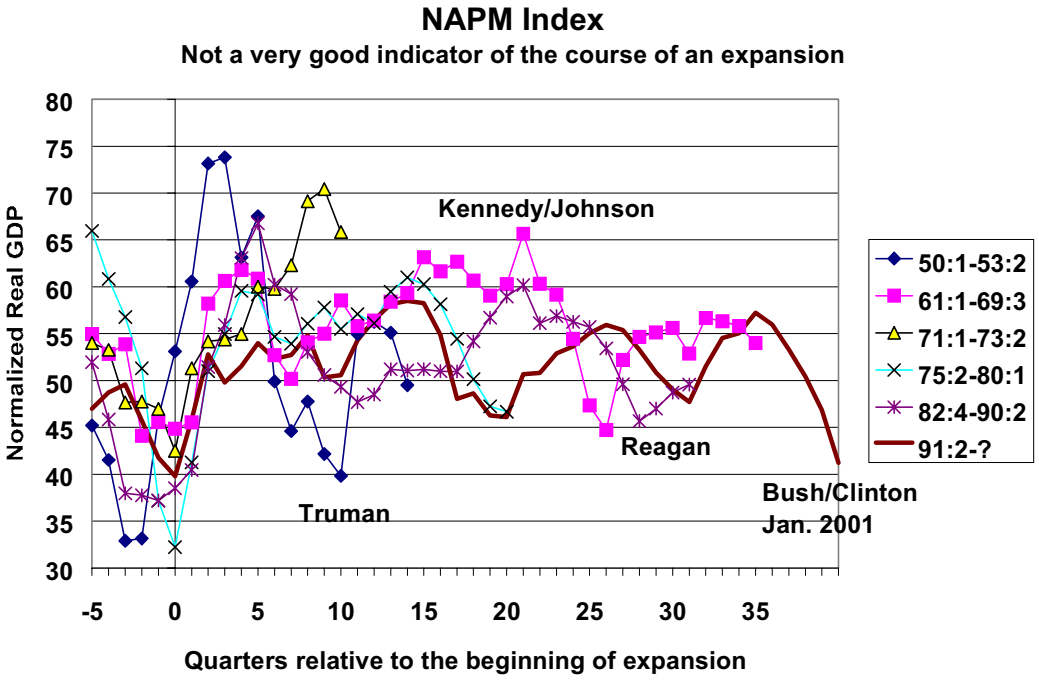
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.197795	2.069554	-0.095574	0.9239
LEADING_INDEX	-1.434564	0.436377	-3.287444	0.0010
LEADING_INDEX(-1)	1.426937	0.437410	3.262237	0.0011

Mean dependent var	0.160494	S.D. dependent var	0.369350
S.E. of regression	0.336275	Akaike info criterion	0.801307
Sum squared resid	8.820302	Schwarz criterion	0.889991
Log likelihood	-29.45295	Hannan-Quinn criter.	0.836888
Restr. log likelihood	-35.67952	Avg. log likelihood	-0.363617
LR statistic (2 df)	12.45313	McFadden R-squared	0.174514
Probability(LR stat)	0.001976		
Obs with Dep=1	68	Total obs	81
Obs with Dep=0	13		

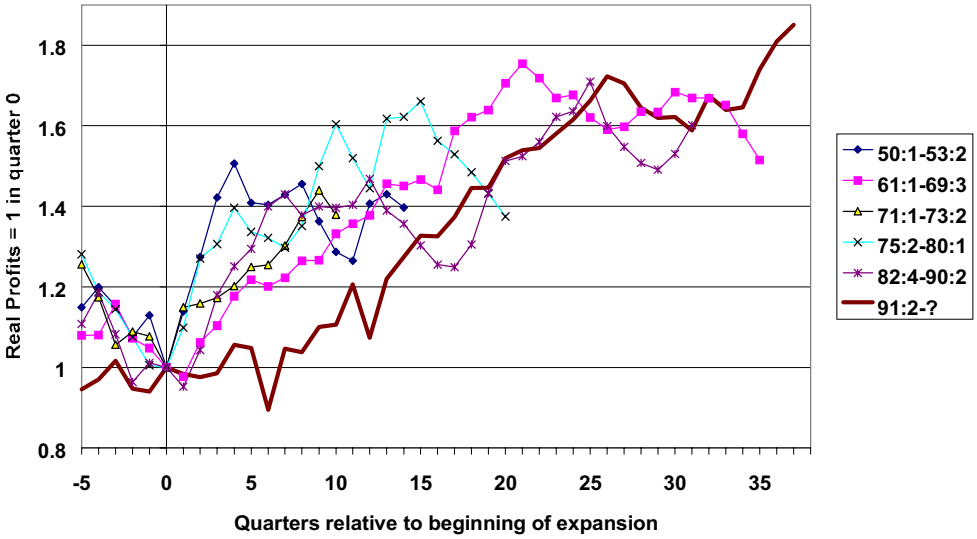
Note: END4 is an 0-1 indicator selecting the last four quarters of each expansion. No adjustment has been made for the intertemporal dependence of this indicator

Appendix: Additional Graphs





Real Corporate Profits over Six Expansions
Stagnant Profits May Contribute to Ending Expansions



Real Interest Rate: 3 Month Tbill - Inflation
Rising Real Interest Rates threaten to terminate the Bush/Clinton expansion