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HOUSING IS THE BUSINESS CYCLE

Edward E. Leamer

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ABSTRACT

Of the components of GDP, residential investment offers by far the best early warning sign of an oncoming recession. Since World War II we have had eight recessions preceded by substantial problems in housing and consumer durables. Housing did not give an early warning of the Department of Defense Downturn after the Korean Armistice in 1953 or the Internet Comeuppance in 2001, nor should it have. By virtue of its prominence in our recessions, it makes sense for housing to play a prominent role in the conduct of monetary policy. A modified Taylor Rule would depend on a long-term measure of inflation having little to do with the phase in the cycle, and, in place of Taylor's output gap, housing starts and the change in housing starts, which together form the best forward-looking indicator of the cycle of which I am aware. This would create pre-emptive anti-inflation policy in the middle of the expansions when housing is not so sensitive to interest rates, making it less likely that anti-inflation policies would be needed near the ends of expansions when housing is very interest rate sensitive, thus making our recessions less frequent and/or less severe.

Edward E. Leamer
John E. Anderson Graduate School of Management
University of California, Los Angeles
Box 951481
Los Angeles, CA 90095-1481
and NBER
edward.leamer@anderson.ucla.edu

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Housing Is the Business Cycle

Edward E. Leamer[+]
UCLA

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Introduction

My goal is to provide unforgettable images that leave a lasting impression regarding the importance of housing to what we call the business cycle. Before we get to the displays, I need to issue a couple of caveats and comments.

Housing and Academic Macroeconomics

The *bad* news is that I am not a macro-economist. Wicksell and Hayek and Keynes and Friedman and Tobin and Lucas and Prescott speak foreign languages with which I have familiarity but not mastery.

The *good* news is that I am not a macro-economist. That frees me from the heavy conceptual burdens that most macro economists seem to carry. It allows me to conclude that Keynesian thinking, monetarism, rational expectations and real business cycles all suffer from the same problem – too much theory and not enough data. In particular, none of these comes to grips with the role of housing in modern US recessions.

Indeed, if you look up "real estate" in the index to Mankiw's(2007) best selling *Principles of Macroeconomics*, you will find real exchange rates, real *GDP*, real interest rates, real variables, and even reality, but no real estate. Under "housing" you will find a reference to the CPI and to rent control, but no reference to the business cycle. I have not

[+] Professor of Management, Economics and Statistics, UCLA. Comments from Sebastian Edwards, Stuart Gabriel, Jerry Nickelsburg, Ryan Ratcliff, Ron Rogowski, David Shulman and Jeff Timmons are gratefully acknowledged as is research assistance from Daniel Dias.

been able to find any macroeconomic textbook that places real estate front and center, where it belongs.[1]

But it's not just a problem with our theory. The NBER macroeconomics data miners have largely missed housing too. The index to Victor Zarnowitz' (1992) *Business Cycle, Theory, History, Indicators, and Forecasting* has no reference to real estate or to housing. (Actually, there are no "h"s in the index at all.) Likewise, the index to James H. Stock and Mark W. Watson's edited volume, *Business Cycles, Indicators and Forecasting*, has no references to residential investment or to housing. Housing is treated with the same level of interest that building permits has in the Index of Leading Indicators: one of many things that might predict a recession, about as interesting as x_7 in the list x_1, x_2, x_3, …., x_{10}.

There is a substantial, mostly older literature on the modeling of residential investment. (e.g. Alberts(1962), Fair(1972), Ketchum(1954), de Leeuw and Gramlich(1969)) This literature takes the overall business cycle as given and explores the effects of income and interest rates on residential investment. By including interest rates as explanatory variables, this literature does explicitly explore the link from monetary policy to housing, but when Maisel(1967), for example, reports that residential investment is an important channel through which monetary policy affects the economy, that finding is treated like the discovery that alcohol has it effects by depressing the central nervous system, which is a mildly interesting fact that doesn't at all affect how much we drink. Another round of grog, please.

Something's wrong here. Housing is the most important sector in our economic recessions and any attempt to control the business cycle needs to focus especially on

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[1] To get some insight into the current state of macroeconomics, I recommend a few pages from Frederick Brown's biography *Flaubert* that describe the state of medicine in 18th Century France, contrasting the physicians (theorists) with the surgeons (empiricists).

> Although France had produced the great surgeon Ambroise Paré in Rabelais's time, it took most of the eighteenth century and a battalion of philosophes challenging well-entrenched pieties to clear the ground for clinical medicine. Set against it were not only the church but a high culture whose apologists felt impelled to frame the physical or sensual world in rationalist hypotheses. Behind its ogives on the rue de la Bûcherie, the Medical Faculty, where lectures were given in Latin and readily understood by youths, mostly wellborn, who had earned a master of arts degree, restricted its teaching to humane letters, to natural philosophy, and to medical theory derived from classical texts. Never dissecting a dead person or laying hands on a sick one, future physicians became thoroughly conversant with Hippocrates and Galen, but remained largely ignorant of humanity in the flesh. Proud to be called *antiquarum tenax*, this establishment, which scoffed, for example, at William Harvey's discovery that blood circulates, regarded surgery as a subordinate discipline, a manual or "mechanical" trade, fit for the dexterous and the inarticulate. …. Threatened as they increasingly were, they sought shelter from modern times in the distinction conferred upon humanists by their knowledge of the language that gave one access to medical scripture. However skillful the artisan, without Latin he spoke without intellectual authority. (p.12)
>
> …
>
> When medicine at last began to tilt decisively away from ancestor worship, visual analysis gained ground. Anatomical atlases gradually supplanted classical texts. (p.14)

residential investment. But housing presents a special control problem because monetary policy affects mostly the timing of the building but not the total building. After a surge of building there has to be a time-out, like we are experiencing today, before building can get back to normal, and before this channel through which monetary policy affects the real economy is operative again. ***The Fed can stimulate now, or later, but not both.***

The differences in the dynamics of inflation and housing create a problem for the conduct of monetary policy that is aimed at both inflation and housing-related employment. Inflation is very persistent, and needs to be fought every day. For housing it's the cycle that is persistent. Once the cycle starts, it keeps on going. Like a pebble thrown into a smooth pond of water. The best time to fight the housing cycle with tight monetary policy is when the wave is starting to rise, not when it is cresting. The worst time to stimulate the economy with loose monetary policy is when the wave is starting to rise. That is going to make the crest all the higher, and the crash all the more catastrophic. You know of which I speak, I suppose?

To put the point as clearly as possible, what I am advocating is a modified Taylor Rule that depends on a long-term measure of inflation having little to do with the phase in the cycle, and, in place of Taylor's output gap, housing starts and the change in housing starts, which together form the best forward-looking indicator of the cycle of which I am aware. This would create pre-emptive anti-inflation policy in the middle of the expansions when housing is not so sensitive to interest rates, making it less likely that anti-inflation policies would be needed near the ends of expansions when housing is very interest rate sensitive, thus making our recessions less frequent and/or less severe.

WARNING: Causal conclusions from temporal orderings

Though I am not a macroeconomist, my econometric credentials do give me some special knowledge of the problems of drawing causal inferences from nonexperimental data.

Medieval empirics came to the conclusion that blood-letting helped because the health of the patients often improved after the blood was let, but we know now that temporal orderings do not reveal causality, even though Clive Granger(1969) has christened the *post hoc ergo propter hoc* fallacy with the name "Granger Causality."

For valid causal conclusions, we need an experiment; we need a control group and a treated group. When all we have are non-experimental data, correlation is in the data but causation is in the mind of the observer.

With only temporal orderings and no experimental evidence, we do what empirics do: we rely on stories. To each temporal ordering we attach a predictive narrative or a causal narrative or both. We draw firm causal conclusions from the temporal orderings when the causal narrative is compelling and when there is no equally compelling predictive narrative. This is literature and wisdom, not science.

Take interest rates, for example. A pretty good predictive story is that the arrival of the storm we call recessions is met by a reduction of interest rates. When the storm inevitably dissipates, we cannot conclude that the interest rates caused the recovery merely because of the temporal ordering: first the lowering of interest rates and then the recovery. We sometimes suggest that the umbrellas we carry stop the storms too, but I think we are only joking, aren't we?

We economists have a deep dislike of predictive narratives. Economics, unlike the other social sciences, is a self-consciously interventionist discipline. We think we are designing the best way for our governments to influence the outcomes. For that purpose, of course, we must have causal beliefs. Thus, so as not to confuse the initiates, our introductory economics textbooks rarely mention predictive stories, but instead we indoctrinate our students with the causal narrative of the IS-LM model or the equivalent. For some, the force of the causal story of the IS-LM model has been offset completely by the power of the predictive narrative of the Lucas Critique. For most economists, the knowledge assumptions of the Lucas Critique make that story more than a little far-fetched. Thus IS-LM thinking is very much alive.

So there you have it: It's faith-based decision making, which is much influenced by the rhetorical skills of the advocates. I would be conveying accurately the scientific validity of the opinions expressed here if, in the printed version, about 50% of the pixels were removed so you could hardly read what I have written, and, in the spoken version, if I slurred my speech to the point that you could hardly understand what I have said.

Summary

In the next section, I remind you that for 35 years the US economy has been growing at a surprisingly constant rate of 3%. Within the range of policies tested over the last 35 years, none has had a demonstrable effect on long-term growth. From that I conclude that all we need to worry about is the cycle, provided we don't choose some risky new maneuvers for this Titanic we call the economy.

Section 3 reports the timing facts about the ten US recessions since World War II: We have experienced eight recessions preceded by substantial problems in housing and consumer durables. We have experienced one Department of Defense downturn after the Korean Armistice in 1953 and one Internet Comeuppance in 2000/2001, driven by a collapse in business investment in equipment and software. Except for those two special events, it's been a consumer cycle not a business cycle.

A reason why housing is so important in recessions is the subject of Section 4. Our market system relies on price flexibility to assure that labor and capital are productively employed, but house prices are very inflexible downward, and when demand softens as it has in 2005 and 2006, we get very little price adjustment but a huge volume drop. For GDP and for employment, it's the volume that matters.

In Section 5 I discuss the financial cycle that supports the housing cycle, and look for evidence of a cycle in idiosyncratic house price risk and a cycle in the relative prices of

expensive versus cheap homes, both of which may be symptoms of a mortgage market that reaches ever-deeper into the barrel of current-renters as the expansion continues, picking from that barrel homebuyers with lower incomes and weaker credit scores, who are buying mostly the entry-level of homes. If these cycles do exist, they should attract the attention of our monetary authorities because they cause damage to Americans who can least afford it. The idiosyncratic risk in the Los Angeles market is surprisingly high (30% of value) but not apparently cyclical. But during the "bubble" that is now leaking, it was the smaller homes in the lower-priced zip-codes that experienced the greatest rates of appreciation. That run-up in relative prices of the less-expensive homes could be permanent if innovations in finance have permanently increased the fraction of homeowners, raising the relative demand for cheaper homes. But I doubt it. In 2007, all the anecdotes suggest foreclosures are differentially favoring the lower-income neighborhoods, just as do the pink slips of labor market dismissals. We should care about this.

By virtue of its prominence in our recessions, it makes sense for housing to play a prominent role in the conduct of monetary policy. Section 6 deals with the policy conflicts between inflation targets and hypothetical housing targets. If housing were the target, our Fed has been missing the mark widely, most especially in the aftermath of the 2001 recession when the Fed Funds rate was held so low for so long. Best to remember that the teaser rates for mortgages came from Washington, DC, not from Wall Street, and not from your local mortgage originator.

Of course, the Fed was pursuing an anti-deflation program in 2002-2004. But the message from the housing market is that it is not general deflation or deflation of rental rates that matters; it is the deflation of the asset prices of durables, particularly homes. Declining prices for assets like homes make the (own) real interest rate great even if the nominal interest rate is zero. For a highly leveraged investment like housing, it doesn't take much in the way of an asset price decline to kill off building, even if the rental market is strong, and to completely eliminate any potential for a stimulative rate cut. Ironically, the Fed's great concern about deflation has created the very deflation problem they were trying to avoid.

The inevitable effect of the low rates has been an acceleration of the home building clock, transferring building backward in time from 2006-2008 to 2003-2005. Our Fed thus implicitly made the decision: more in 2003-2005 at the cost of less in 2006-2008. That strikes me as a very risky choice. The historical record strongly suggests that in 2004 and 2005 we poured the foundation for a recession in 2007 or 2008 led by the collapse in housing we are currently experiencing. Only twice have we had this kind of housing collapse without a recession, in 1951 and in 1967, and both times the Department of Defense came to the rescue, because of the Korean War and the Vietnam War. We don't want that kind of rescue this time, do we?

But don't worry. This time we don't need the DOD to save us. This time troubles in housing will stay in housing. It's because manufacturing has done an "L" of a job. An official recession cannot occur without job loss, but as can be seen in Figure 1, outside of

manufacturing and construction there is little or no job loss. The sectors with volatile employment are manufacturing and construction, illustrated in Figure 2. Look at manufacturing. It's V, V, V in every recession - a sharp drop in jobs and a sharp recovery. The 1990 recession was different. That was a U. But in the 2001 recession we got an L! Though this is largely uncharted territory, it doesn't look like manufacturing is positioned to shed enough jobs to generate a recession. And without the job loss, expect the housing adjustment to be shallower but more long-lasting.

Finally, in the concluding section, in an already overly long paper, I offer some brief comments on the links between consumer durables and homes, and briefly survey the literature on housing and the business cycles in other countries.

Figure 1 **Total Nonfarm Employment Excluding Manufacturing and Construction**

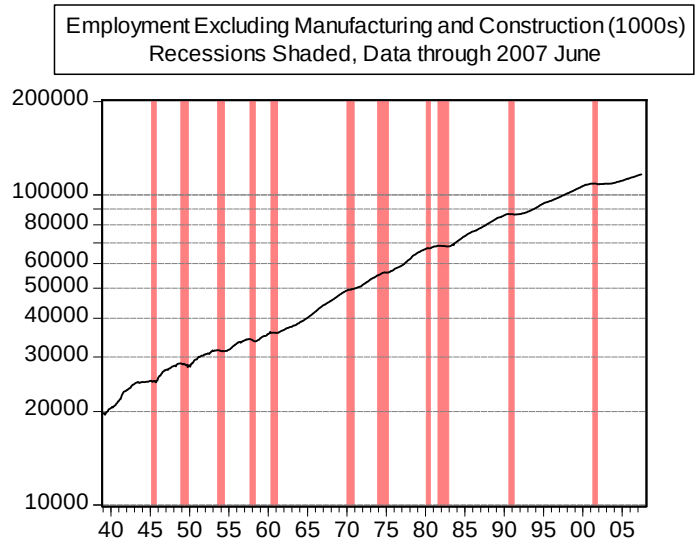
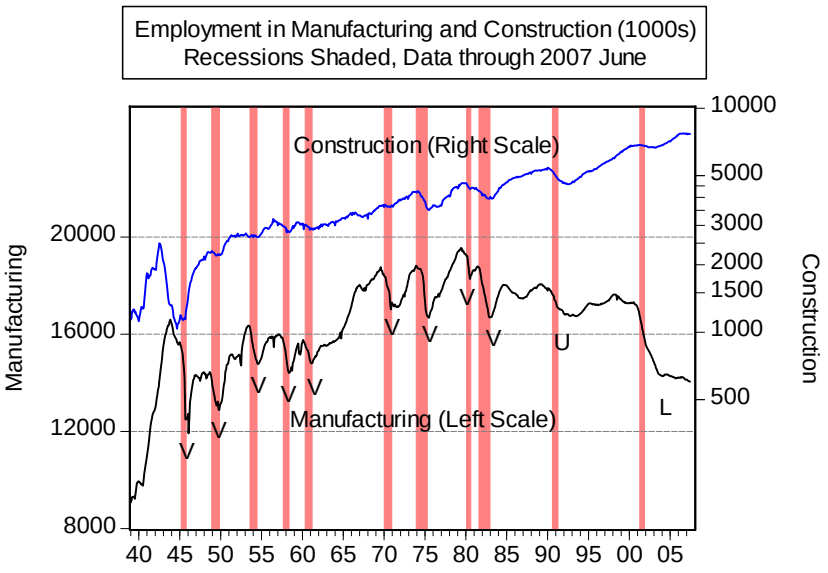


Figure 2

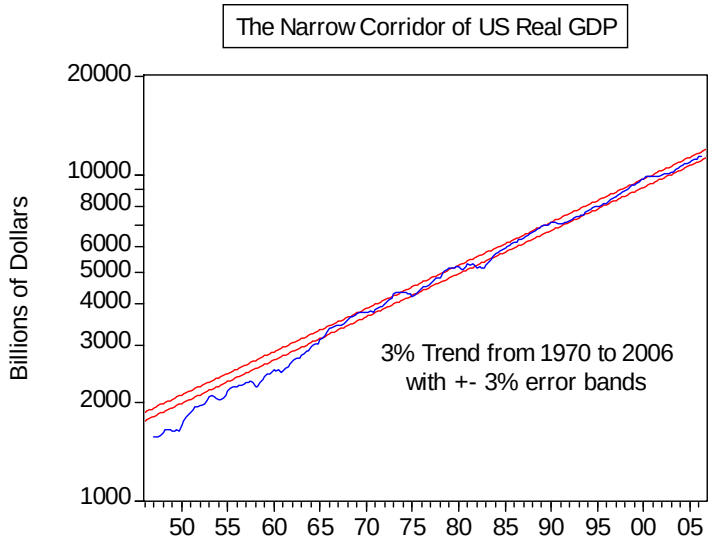


The 3-3 Rule of US Real GDP

As far as US Real GDP is concerned, don't worry about long-run growth.

Make a list of events over the last 40 years that you imagine might have substantially affected the level of US GDP. Does your list include the 1970s oil price shocks, the Reagan tax cuts, the inflation of the 1970s, the evolution of real rates of interest, the peace dividend, the economic liberalizations in the developing world, the personal computer, the Internet Rush, and the Bush W. tax cuts? Surely, you must imagine, most of these have had an apparent impact on US GDP. Sorry, you are mistaken. Take a look at Figure 3, which illustrates US Real GDP with a logarithmic scale that turns constant rates of growth into straight lines. Since 1970, US Real GDP has snaked upward along a straight constant-growth line, seemingly ignoring completely all the "shocks" that have buffeted the system. Just in case you cannot see how straight the line has been, I have put a ±3% corridor around the 3% trend line. That's the 3-3 rule of US Real GDP. The US GDP rarely strays more than 3% from the 3% per year trend line.

Figure 3 The Narrow Corridor of US GDP



I am not a believer in immutable constants of complex human social systems and the 3-3 rule of GDP growth does not have the scientific validity of 9.8 meters per second squared, but the facts are what they are. I take this fact to mean that within their historic range of variability, fiscal and monetary policies have had negligible effects on long-run growth. From this I conclude that fiscal and monetary policy should be focused on the task that remains: ironing out the cycle, and keeping real GDP well within its natural corridor of growth.

Temporal Orderings of Components of GDP

First homes, then cars, and last business equipment.

Though concerns about long-run growth are allayed by the 3-3 rule, there is still ample scope for policies to affect the amplitude and frequency of the ups and downs of the economy within the narrow corridor of economic growth. To plan these policy interventions, we need to determine what causes the recessions and what can make them less frequent or less extreme. Useful inputs into the formation of causal beliefs are the timing facts: which moves first and which moves later? In this section, I will discuss the timing of the components of GDP first using an "episodic approach" that focuses only on the recessions and that allows each recession to have its own timing. When that is done, we can summarize what we learn with a regression analysis that acts as if the timing were the same at every point in the business cycle: recession, recovery, expansion or spurt. In case you cannot wait: first and foremost it's homes that predicts recessions.

Residential Investment Is a Small Part of Long-run Growth

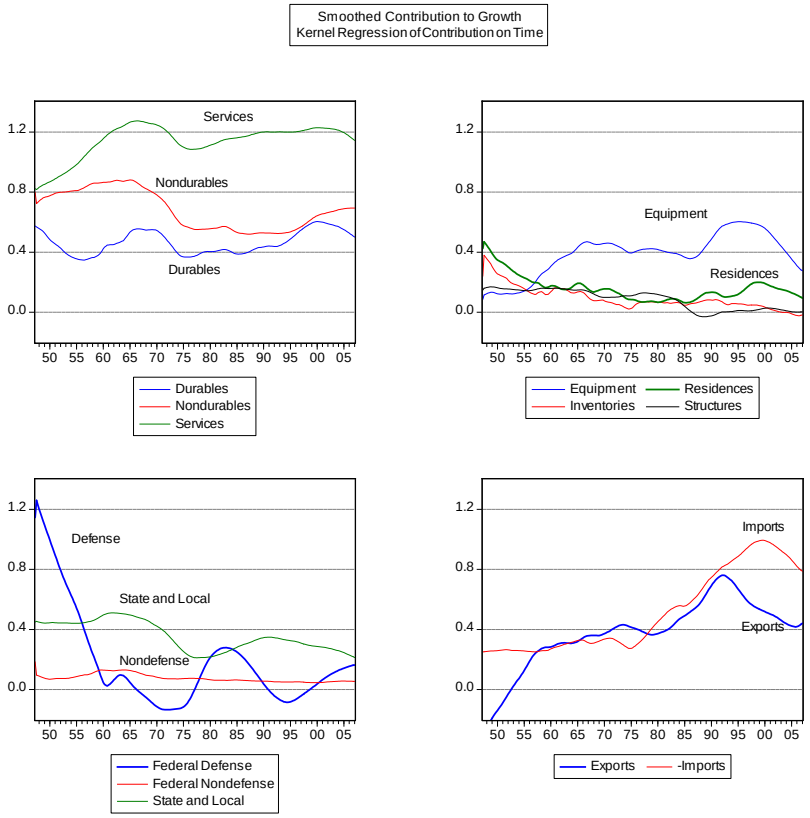
The BEA compiles a table called "Contributions to Real GDP growth" indicating the contribution of each component to the total GDP growth. Summary statistics of these contributions are reported in Table 1 for three separate periods: the high growth period from 1947 to 1969, the slower but unstable period from 1970 to 1984 and the stable period 1985 to 2006.

Table 1 Contributions to US GDP Growth

	Three Subperiods								
	1947Q2 1969q4			**1970q1 1984q4**			**1985q1 2006q4**		
	Mean	Std. Dev.	Qrtrs	Mean	Std. Dev.	Qrtrs	Mean	Std. Dev.	Qrtrs
GDP	4.03	4.92	91	3.16	4.81	60	3.10	2.02	88
Durables	0.47	1.90	91	0.42	1.32	60	0.49	0.92	88
Nondurables	0.85	1.16	91	0.57	0.79	60	0.59	0.45	88
Services	1.09	0.57	91	1.11	0.64	60	1.20	0.52	88
Defense	0.41	1.98	91	-0.01	0.66	60	0.05	0.50	88
Nondefense	0.12	0.84	91	0.08	0.42	60	0.05	0.21	88
State and Local	0.48	0.39	91	0.22	0.46	60	0.32	0.28	88
Equipment and Software	0.27	1.06	91	0.44	0.94	60	0.46	0.68	88
Inventories	0.14	3.41	91	0.13	3.03	60	0.01	1.56	88
Residential Investment	0.21	1.21	91	0.14	1.17	60	0.13	0.46	88
Structures	0.16	0.35	91	0.12	0.56	60	-0.01	0.38	88
Exports	0.13	1.28	91	0.36	1.01	60	0.62	0.75	88
Imports	-0.29	0.85	91	-0.42	1.49	60	-0.81	0.91	88

Figure 4 illustrates the "normal" contribution of each of these components, found by a kernel regression of the component on a time trend.[2] It is clear from the numbers in Table 1 and the displays in Figure 4 that the largest normal contribution comes from consumer services. Next in magnitude are the other consumer spending items: nondurables and durables. Among the investment items, equipment and software has risen greatly in importance, especially during the Internet Rush. *Residential investment contributes a small fraction to total growth (recently, 4.2% of the total: 0.13 out of 3.10).* Inventories and structures hardly contribute at all.[3] [4]

Figure 4 Smoothed Contributions to Growth (Kernel Regression)



[2] Alternative ways of filtering the signal from the noise in these data include exponential smoothing, moving averages, the Kalman Filter and the Hodrick-Prescott Filter. These filtering techniques are designed primarily for short-term forecasting and they produce smoothed series that track the short term movements in the data too closely for our purpose, which is to uncover the long-term moving trend. Thus after some significant trial and error, I hit upon the kernel regression smoother.

[3] The decline in GDP growth in the 1970s is evident in all three consumer components, and in state and local government, but not in the other components. That's a puzzle worth exploring.

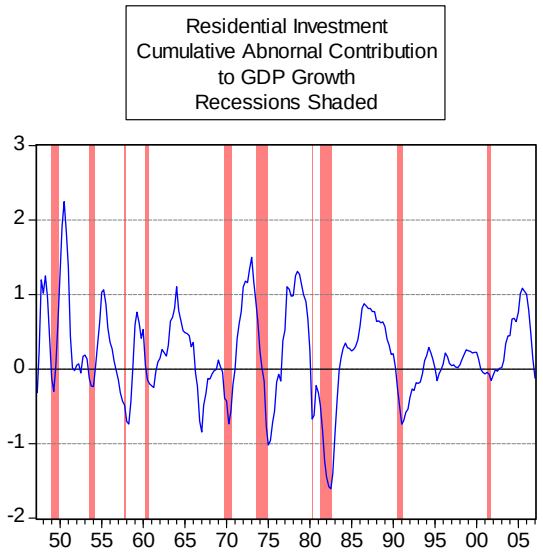
[4] In terms of volatility as measured by the standard deviation, the inventories component is by far the largest. Much of the increased stability of GDP growth after 1984 is directly due to a reduction in the volatility of the inventory contribution to GDP How much of this reduction is due to improved inventory management and how much comes from greater stability of sales is not obvious. After all, the volatility of every component of GDP declined after 1985, including most especially residential investment, durables and nondurables, all of which have substantial amounts of inventory in their supply chains and on retail shelves. See, e.g.. McConnell et.a. (2000), or Cecchetti et. al.(2006) .

The Residential Investment Contribution to US Recessions Is Huge

For long-run growth, residential investment is pretty inconsequential, but for the wiggles we call recessions and recoveries, residential investment is very very important. To make this visually clear, I have created a series of figures that illustrate what was happening to each of the contributions to growth before and during the recessions. These figures are created in three steps:

1. *Find the abnormal contribution* by subtracting out the normal contribution estimated with the kernel smoother discussed in the previous section.

Figure 5



2. *Cumulate these abnormal contributions*, thus turning the growth rates into levels. See the residential investment example Figure 5 to the left which wiggles up and down around zero by construction. When the curve is moving down, the contributions are less than normal; when the curve is moving up, the contributions exceed normal.

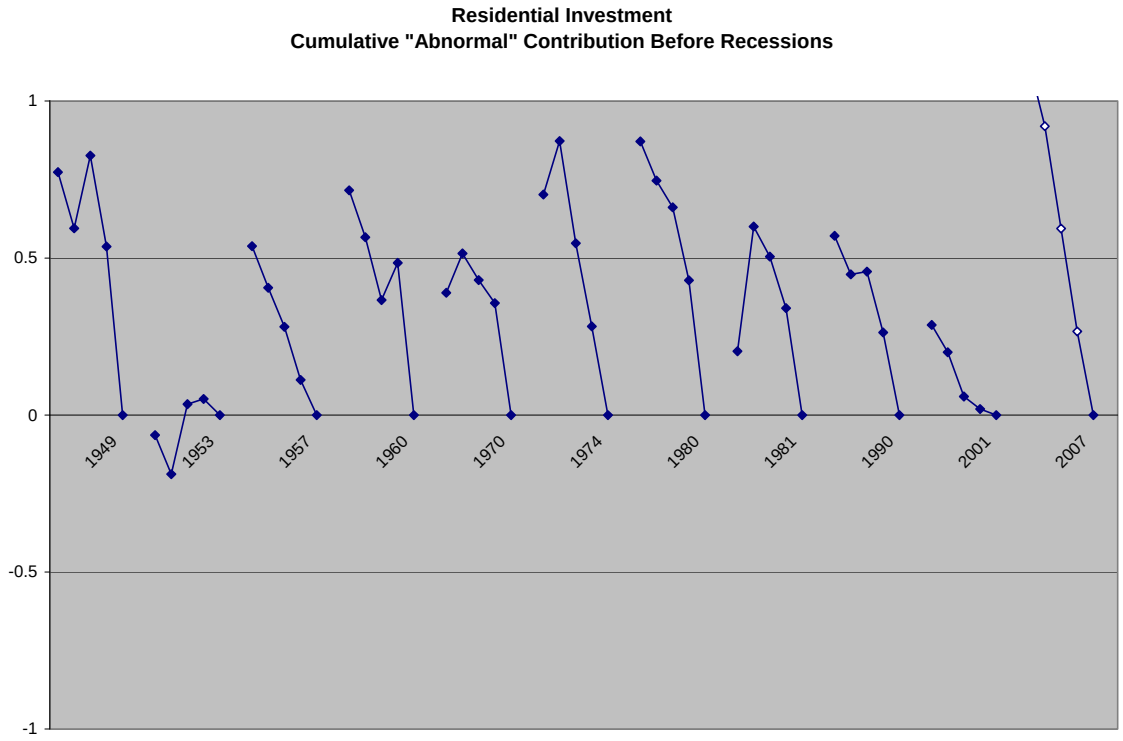
3. *Extract the data around the recessions, normalized* by subtracting the value at the cycle peak. This makes the value at each cycle peak equal to zero.

This produces a set of figures like the one for residential investment, Figure 6. The ten downward sloping curves in the top panel of this figure illustrate what was happening to residential investment in the year before the ten cycle peaks; the ten V-shaped curves in the bottom panel illustrate what was happening in the subsequent two years, a period long enough to encompass all the recession quarters. [5] For your amusement, I have also included that last five quarters of data, ending with 2007Q1. We have recently been skiing down a steep slope like the ten steep slopes preceding the ten recessions. Note that the data for the ten cycle peaks are normalized to zero and displayed twice for each recession: once in the top panel and once in the bottom panel.

Figure 7 is the corresponding graph for business spending on equipment and software. Figures for the other components can be found in an appendix.

[5] The longest of these recessions (1974) was 5 quarters in length. The 1980 post-recession period is abbreviated since it quickly transitioned into the 1981 recession.

Figure 6 **Weakness or Strength of Residential Investment Before and During Recessions**



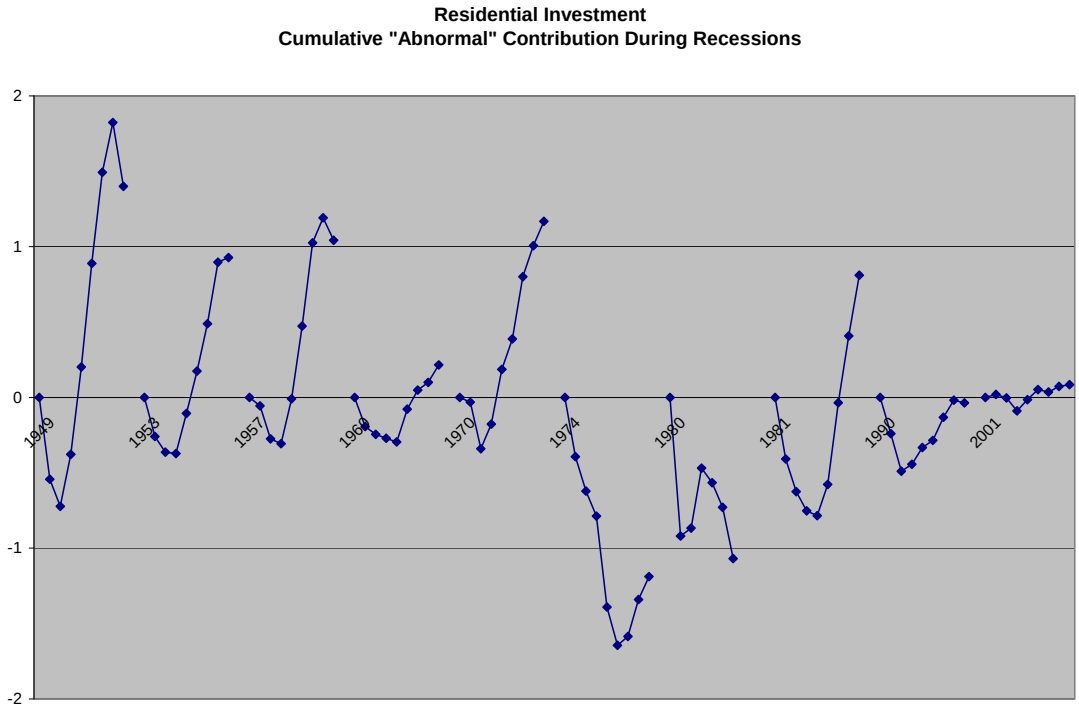
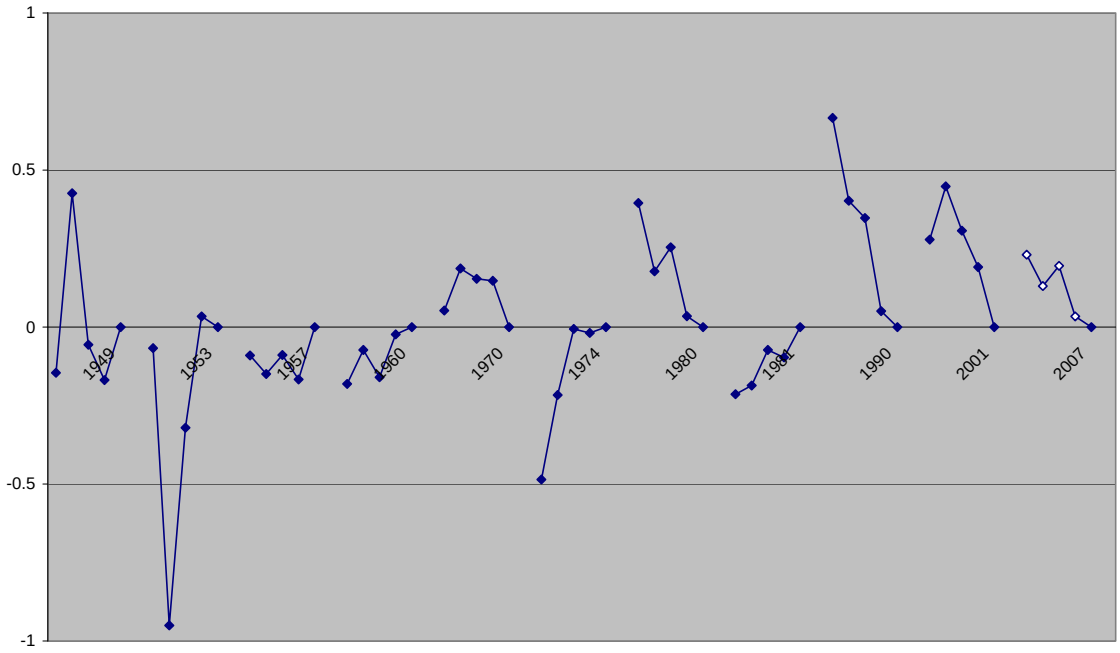
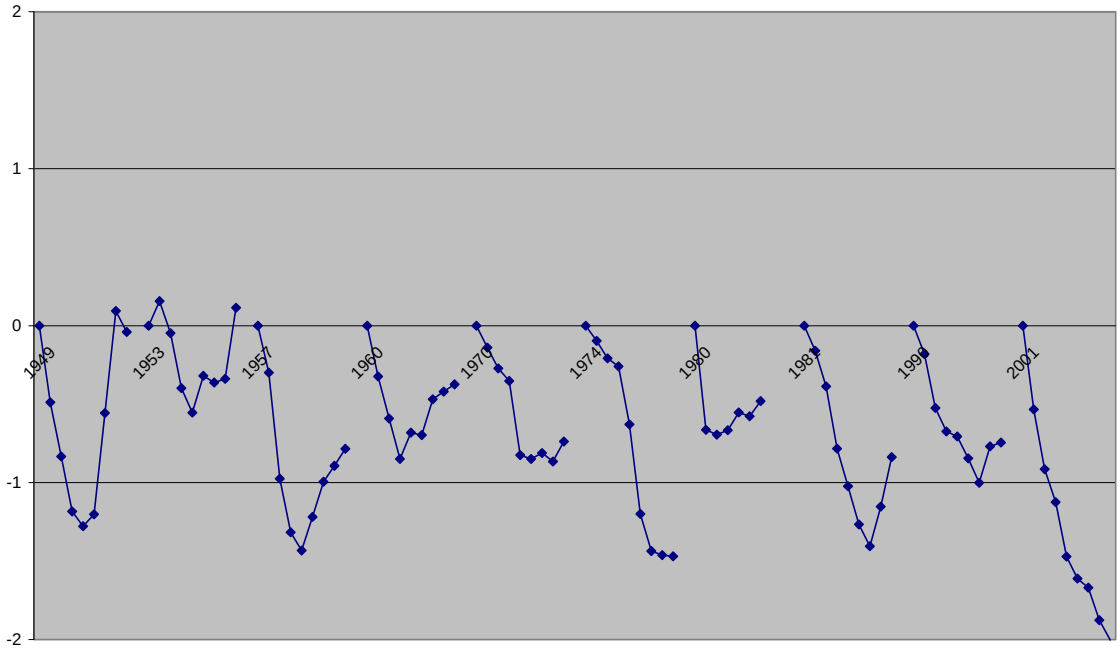


Figure 7 **Weakness or Strength of Equipment and Software Before and During Recessions**

Equipment and Software
Cumulative "Abnormal" Contribution Before Recessions



Equipment and Software
Cumulative "Abnormal" Contribution During Recessions



If you pause a moment to master these figures, I promise that you will be rewarded with special understanding of the US business cycle. Most importantly, keep in mind that what is displayed is the *cumulative abnormal* contribution to GDP growth. If the line is flat, that means the contribution, quarter after quarter, is normal. If the line is declining, that means that the contribution, quarter after quarter, is less than normal, and this component is contributing to weakness in GDP growth. If the line is rising, that means that the contribution, quarter after quarter, is greater than normal, and this component is contributing to strength of GDP growth. *So take a look at the figures and see if you can see falling, flat or rising.*

The residential investment curves in Figure 6 are all diving down in the top panel and making a quick U-turn in the bottom panel. Thus residential investment is subtracting from GDP growth before the recessions but starts to contribute more than normal in the second or third quarter of the recessions. See how different are the equipment and software graphs in Figure 7. The diving down of equipment and software prior to the recession in the top panel is not so great and not so consistent as residential investment. And the U-turn at the bottom for equipment and software is deeper and much delayed compared with residential investment.

In words, residential investment consistently and substantially contributes to weakness before the recessions, but business investment in equipment and software does not. And the recovery for residences begins earlier and is complete earlier than the recovery for equipment and software.

How big are these declines? The decline of the residential investment abnormal cumulative by almost 1 full point in the year before the 1980 recession means that residential investment was removing almost 1% from the normal GDP growth of 3%. In terms of weakness in housing, this was the most severe event, followed closely by the 1973 downturn. *Eight of the ten recessions were preceded by sustained and substantial problems in housing, and there was a more minor problem in housing prior to the 2001 recession. The one clear exception was the 1953 recession, which commenced without problems from housing.*

In the bottom panel of Figure 6 we can see that problems in housing rather quickly turned around and housing started to contribute strength not weakness two or three quarters into the recessions. In most cases, the weakness in the recession was more than offset by growth during the recovery within the two-years displayed (i.e. the final values displayed exceed zero at the end of eight quarters).[6]

Contrast Figure 6 for residential investment with Figure 7, which illustrates the cumulative abnormal contributions of business spending on equipment and software. *Prior* to the recessions, there was no apparent weakness in equipment and software in the

[6] One exception was the 1974 recession. This one had a very severe housing problem before the recession and the most severe during the recession. The short-lived 1981 recession (two quarters) had a housing recovery that quickly collapsed. The diagram displays only six quarters for this recession because the seventh was the first quarter of the 1981 recession.

first eight recessions. But equipment and software spending was a major contributor to weakness *during* all the recessions except the short-lived 1981 event.

And then, if you have the time, peruse all other components of GDP displayed in the figures in the Appendix, and make your own conclusions regarding what moves first and what comes later. Keep in mind that the data for all ten recessions are displayed here, not just averages that might mask the peculiarity of some of the recessions. My conclusions are coming after we build some tabular summaries of all these figures and some persuasive summary figures. But already the message is forming: weakness in residential spending precedes recessions; weakness in equipment and software coincides with the recessions. That temporal ordering ought to be considered when we weave our causal stories.

A Summary Table

The figures illustrating the cumulative contributions around the recessions are summarized numerically in Table 2. The top panel reports data for the year before the ten recessions, and the bottom panel reports data during the recessions. The data that form this table are answers to the questions: What was the maximum decline in the cumulative abnormal contribution before the ten recessions and what was the maximum decline during the recessions? The last row of each panel in Table 2 reports the sum of these values, and the numbers above that row refer to the share of that weakness, component by component.

Thus, for example, in the year prior to the 2001 recession, there was a total weakness that shaved 2.4 percentage points off GDP. Of that total, 23% was due to weakness in consumer durables, 19% percent was due to weakness in spending on equipment and software, and 20% was due to weakness in exports.

In this table, the largest contributor to each of the recessions is printed in bold with a box. The next to last column of this table reports the averages across the ten recessions, and the last column is an average of seven recessions, excluding 1953 and 2001 because of their unusual nature and 1949 because it both unusual and old.

The 1953 downturn was caused by a huge shift in DOD spending commencing virtually the day the Korean armistice was signed on July 27, 1953, which coincides exactly with the official cycle peak. Caught unawares, the economy experienced virtually no prior-weakness, totaling only –0.9 compared with numbers –2 or more for all the other recessions. The explanation of the 1953 recession is in the bottom panel, where we discover the huge total concurrent weakness of -8.5, 47% due to Department of Defense spending.

The 2001 event is accurately called the Internet Comeuppance. When profits on the Web disappointed investors, firms responded by cutting back investment in equipment and software, the component that played an unusually large role both before and during the 2001 downturn.

The last column of Table 2 reports the averages for the seven "normal" recessions, with the 1953 Defense Downturn, the 2001 Internet Comeuppance and the ancient 1948 recession omitted. The two panels in the table are sorted by these Avg-7 numbers, with the largest contributor at the top. The figures in the appendix are sorted the same way. Do you see what's on top?

Table 2

Contribution to Weakness in GDP, The Year Before the Recession

Largest in Bold and Boxed

	1949	**1953**	1957	1960	1970	1974	1980	1981	1990	**2001**	Avg	Avg-7
Residential Investment	**30%**	6%	**22%**	**30%**	**20%**	**29%**	**32%**	22%	21%	12%	22%	25%
Durables	19%	18%	20%	12%	20%	24%	26%	10%	**26%**	**23%**	20%	20%
Services	3%	0%	16%	2%	2%	9%	17%	**28%**	2%	8%	9%	11%
Nondurables	7%	7%	0%	8%	11%	21%	10%	8%	8%	7%	10%	9%
Exports	27%	31%	17%	0%	5%	0%	0%	14%	6%	20%	17%	6%
Equipment and Software	15%	4%	0%	0%	7%	0%	15%	0%	25%	19%	14%	7%
Fed Defense	0%	0%	0%	22%	16%	12%	0%	0%	8%	2%	10%	8%
Fed Nondefense	0%	0%	16%	20%	6%	4%	0%	3%	0%	3%	7%	7%
State and Local	0%	**34%**	1%	7%	10%	0%	0%	16%	3%	2%	8%	5%
Structures	0%	0%	8%	0%	2%	2%	0%	0%	1%	3%	3%	2%
TOTAL	-2.8	-0.9	-2.4	-2.3	-2.5	-3.1	-2.7	-2.7	-2.7	-2.4	-2.5	-2.64
Inventories/TOTAL	23%	48%	4%	63%	24%	0%	28%	0%	8%	45%	24%	18%
Imports/TOTAL	14%	50%	5%	2%	20%	0%	0%	14%	0%	0%	10%	6%

Contribution to Weakness in GDP, Two Years Since Recession Began

Largest in Bold and Boxed

	1949	1953	1957	1960	1970	1974	1980	1981	1990	2001	AVG	AVG-7
Equipment and Software	**20%**	7%	**24%**	19%	14%	17%	10%	21%	**18%**	**35%**	19%	18%
Durables	5%	11%	18%	**24%**	20%	15%	14%	10%	18%	5%	14%	17%
Nondurables	11%	11%	15%	16%	7%	16%	11%	5%	16%	7%	12%	12%
Exports	7%	2%	15%	12%	12%	10%	6%	**26%**	4%	33%	13%	12%
Residential Investment	12%	4%	5%	7%	6%	**19%**	**16%**	12%	9%	2%	9%	10%
Structures	12%	4%	5%	7%	6%	**19%**	**16%**	12%	9%	2%	9%	10%
Services	11%	6%	4%	7%	6%	4%	13%	8%	15%	17%	9%	8%
Fed Defense	11%	**47%**	14%	0%	**28%**	0%	1%	0%	5%	0%	11%	7%
State and Local	0%	0%	0%	4%	1%	0%	13%	4%	4%	0%	3%	4%
Fed Nondefense	11%	8%	1%	4%	1%	0%	0%	3%	1%	0%	3%	2%
TOTAL	-6.2	-8.5	-6.0	-4.5	-6.0	-8.6	-6.9	-6.6	-5.4	-5.8	-6.5	-6.3
Inventories/TOTAL	56%	18%	22%	35%	16%	31%	23%	39%	12%	13%	27%	25%
Imports/TOTAL	6%	0%	6%	0%	0%	0%	0%	5%	0%	0%	2%	2%

Here's the message: *It is residential investment that contributes most to weakness before recessions.* In six of the ten recessions, residential investment was the greatest contributor to weakness prior to the recession. Only twice of ten did residential investment not contribute significantly to weakness prior to the recession: the 1953 and 2001 oddballs.

After residential investment as a contributor to prior weakness come consumer durables, consumer services, and then consumer nondurables. Those are all consumer spending items – it's weakness in consumer spending that is a symptom of an oncoming recessions.

Equipment and software ranks as the number *one* source of weakness *during* the recessions, compared with a rank of *six prior* to the recessions. In terms of their impacts during recessions, after business spending on equipment and software come consumer spending on durable and nondurables.

Average Cumulative Abnormal Contribution: Seven Consumer Cycles

Numbers are difficult to internalize, so to get the message inside your head, averages of these contributions over the seven recent normal recessions are illustrated in Figure 8 (Consumer spending), Figure 9 (Business spending), Figure 10 (Government Spending), and Figure 11 (External Spending). These are the climax we have all been waiting for.

All four of the consumer items in Figure 8 contribute substantially to the path of a recession, both before and during. The timing is: homes, durables, nondurables and services. Housing is the biggest problem in the year before recession, but is the first to start to improve in the second quarter of the recession. Durables is the biggest problem during the recession, turning around at quarter 4. Nondurables has relatively little weakness prior to the recession, but is number two during the recession, second only to durables. Nondurables turns up in the fifth quarter after the cycle peak. Consumer services has the most mild cycle, turning down in quarter -3 and back up in quarter +5.

Business spending illustrated in Figure 9 has *no* weak components prior to the recession. With the onset of the recession, inventory contribution takes a big dip, but quickly recovers. Equipment and software weakness is slower to develop but more long lasting, bottoming out in Q5. The cycle in business structures is even milder and longer, not bottoming out until Q7.

Government spending illustrated in Figure 10 played little role in these eight consumer downturns.

The external sector illustrated in Figure 11 is an important part of the story of these recessions. A significant part of the weakness in demand is shipped abroad via weaker imports, making the (abnormal) import contribution to GDP positive, not the normal negative. But offsetting the positive contribution of imports is a substantial negative contribution of exports. Why is that? Is that the reflected wave of weaker US imports that caused weaker foreign GDP and weaker foreign demand for US exports, or is that

only a symptom of the foreign role in a supply chain that begoms in the US where parts are made and ends in the US where the final product is sold?

Finally, Table 3 reports the total cumulative weakness of all twelve components of GDP, defined as the peak to trough swing in the average cumulatives just displayed. The peak to trough swing in inventories subtracts 1.48 from GDP growth, comprising 19% of the total weakness. After inventories, come consumer durables and residential investment, followed by equipment and software.

Table 3 Contributions to Recessions Episodes

Contributions to Recessions Episodes
Cumulative Total Weakness Before and During
Seven Normal Regression Averages

1	Inventories	-1.48	19%
2	Consumer Durables	-1.33	17%
3	Residential Investment	-1.13	15%
4	Equipment and Software	-1.01	13%
5	Consumer Nondurables	-0.85	11%
6	Exports	-0.81	11%
7	Consumer Services	-0.67	9%
8	Business Structures	-0.56	7%
9	Defense	-0.40	5%
10	Federal Nondefense	-0.23	3%
11	State and Local	-0.14	2%
12	Imports	1.01	-13%
	TOTAL	-7.61	100%

Conclusion; ***It's a Consumer Cycle, not a Business Cycle.*** Prevention of a consumer cycle requires special focus on the volatile components: residences and durables. Target sustainable building of homes and cars, and sustainable rates of appreciation of homes.

Figure 8 **Average Consumer Contributions: Seven Consumer Recessions**

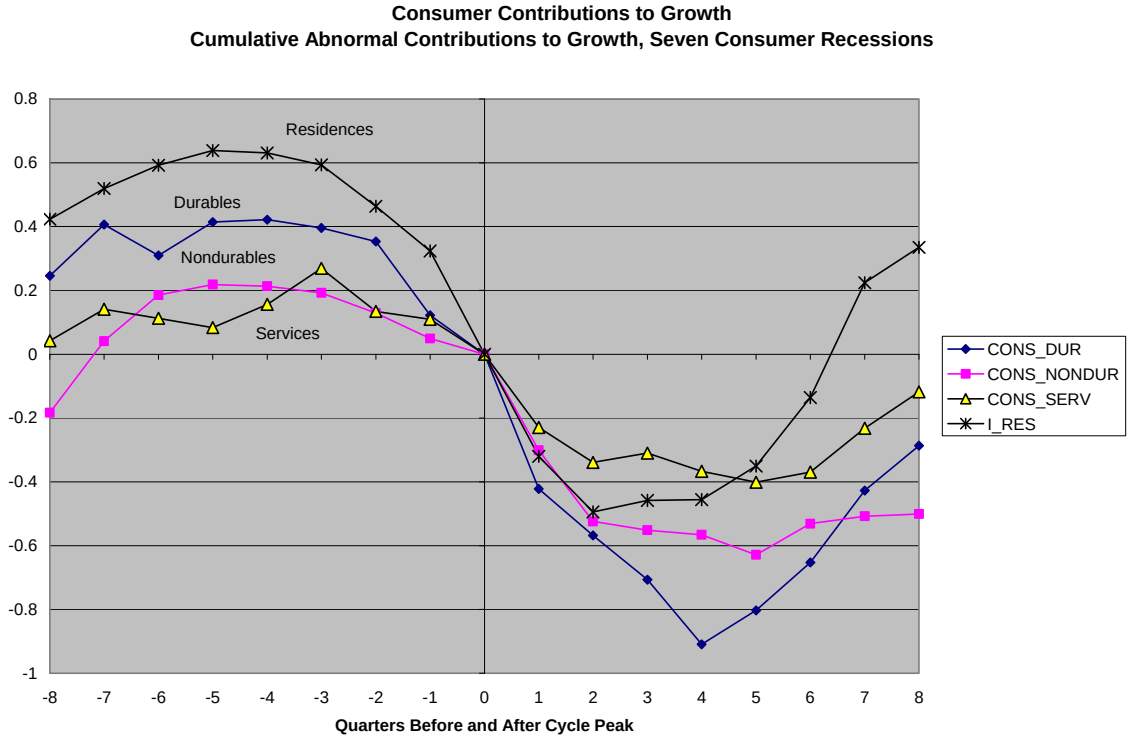


Figure 9 **Average Business Contributions: Seven Consumer Downturns**

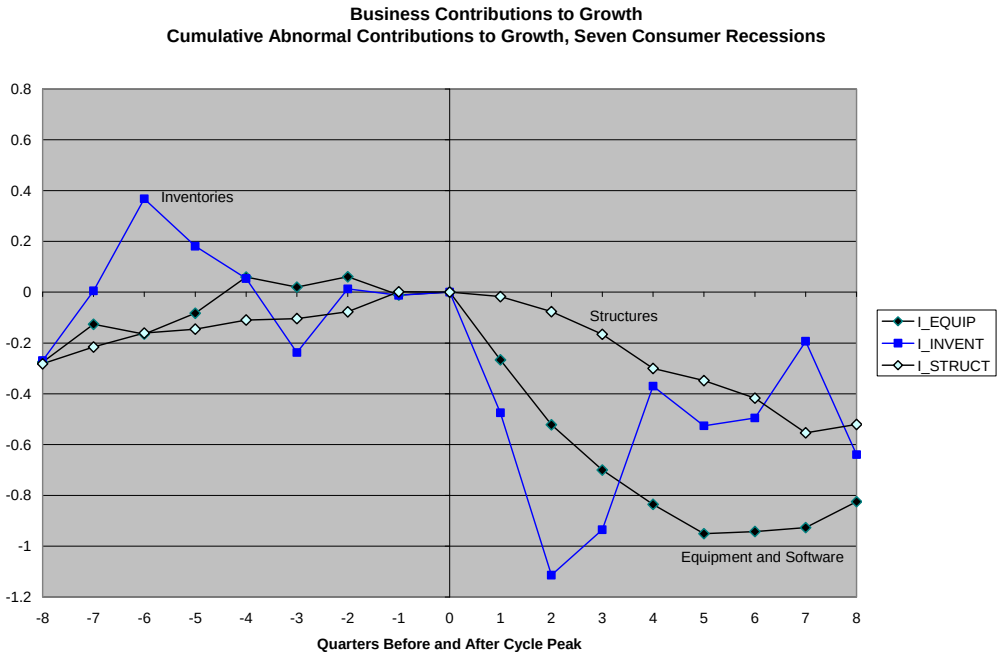


Figure 10 **Average Government Contributions: Eight Consumer Downturns**

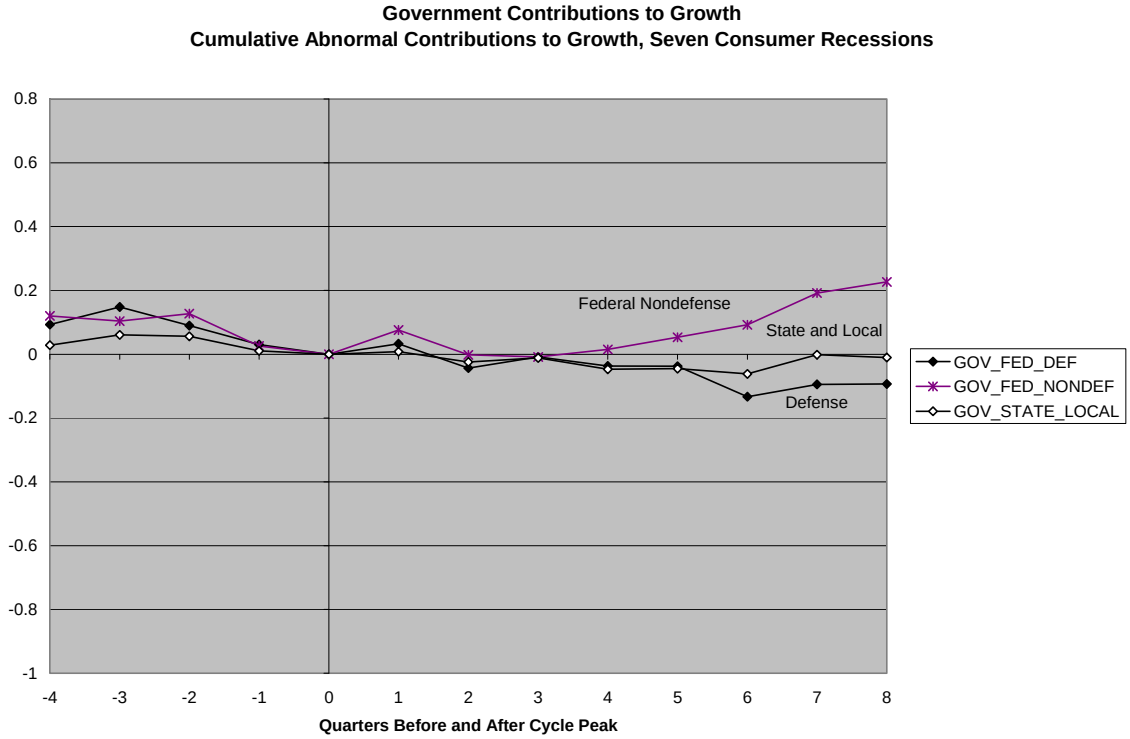
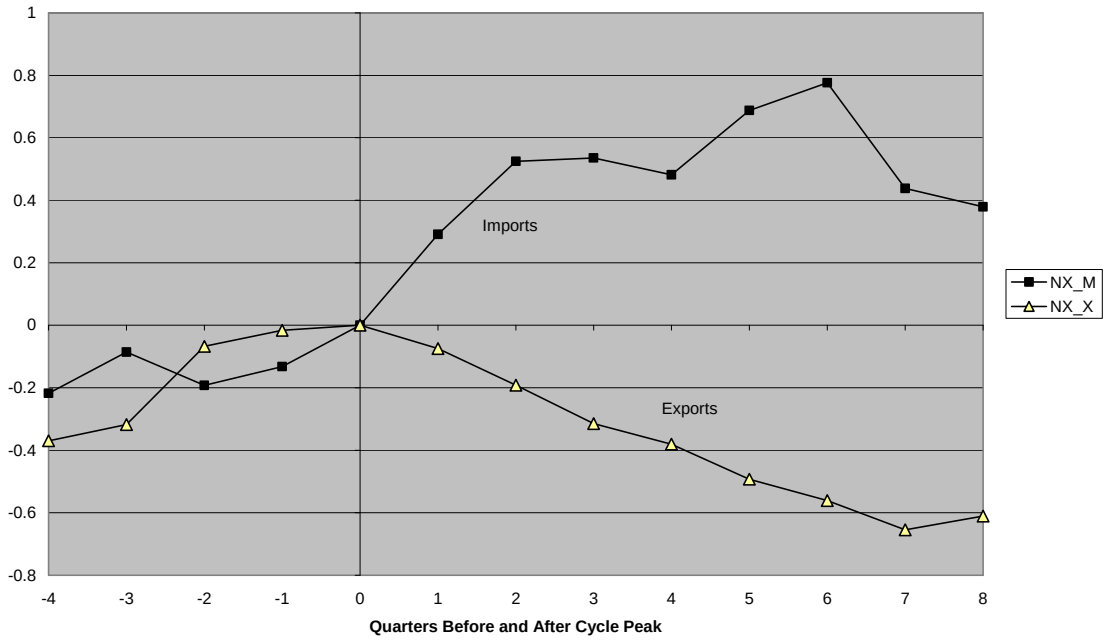


Figure 11 **Average External Contributions: Eight Consumer Downturns**



What about False Positives?

The discussion to this point has focused on "false negatives" meaning recessions that were *not* predicted by weakness in one of the spending components. There can also be false positives: recessions that *were* predicted that did *not* actually emerge. To find these we need to look at all the data, not just the data around recessions.

The cumulative abnormal residential investment data are displayed in Figure 12 with the recessions shaded. This figure includes also the defense contribution. With housing and defense included, we cover about 90% of the US cycle story in the last 60 years.

To find the housing false negatives in this figure look for neutral or increasing residential investment values preceding these shaded regions. One false negative occurred in the 1953 recession. This figure reveals why we had that recession – it was a sharp reduction in DOD spending. The 2001 recession had some small contribution from housing, but it is probably best classified as a false negative. These two false negatives we have already discovered in Figure 6.

Now we want to find the false positives - sharply declining values in periods other than the years before recessions or during the recessions. In the residential investment data displayed in Figure 12 there is one false positive in 1951-2 and another in 1966 -67. In both cases housing was weakening substantially but there was no recession. Why is that? Those two false positives occurred coincidentally with a big ramp-up in defense spending for the Korean War and the Vietnam War. It is best not to think of these as false positives, but rather alarms of forthcoming recessions that were met by a response that prevented the recessions from occurring, however accidental the response might have been.

The bottom line: Housing provides an extremely accurate alarm of oncoming recessions.

What seems like the next best predictor of recessions is consumer durables, illustrated in Figure 13. Consumer durables has a lot in common with residential investment – the Korean War and the Vietnam war false positives and the 1953 and 2001 false negatives.

The next best predictor may be consumer services, illustrated in Figure 14. Here there are so many false negatives, it is hard even to consider it a viable contender.

Figure 12 **Residential Investment: False Positives and False Negatives**

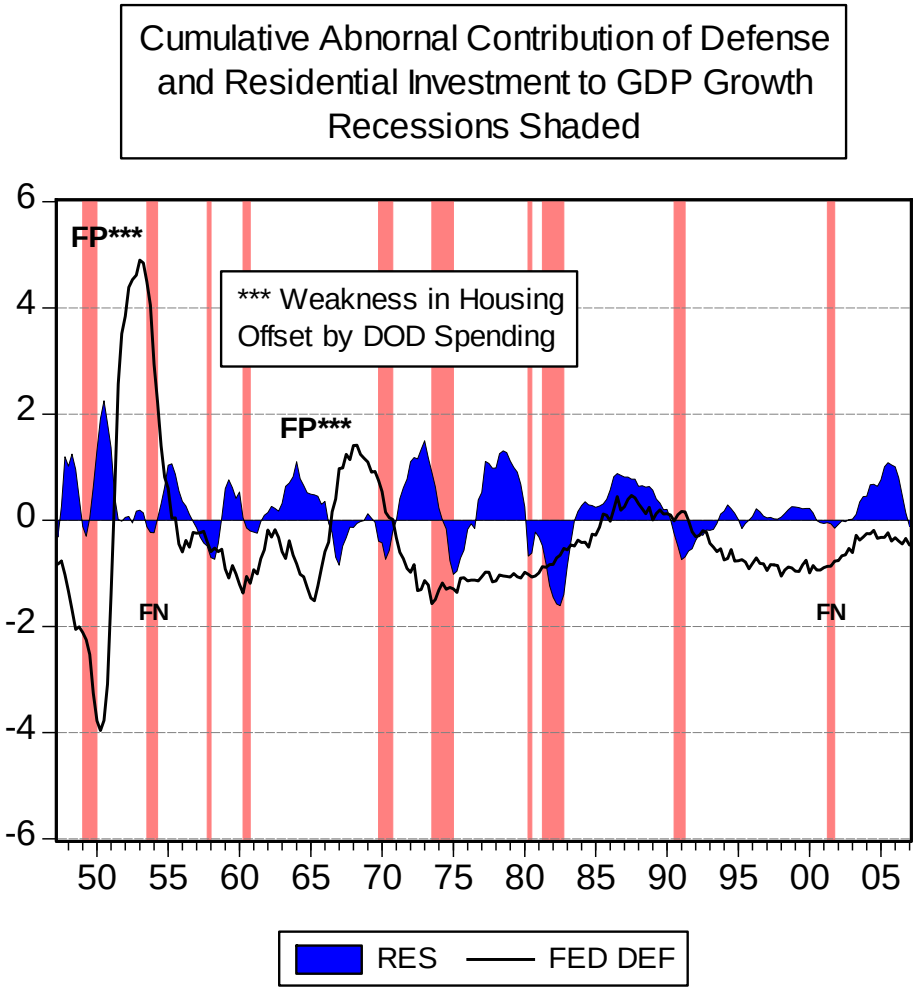


Figure 13 **Consumer Durables: False Positives and False Negatives**

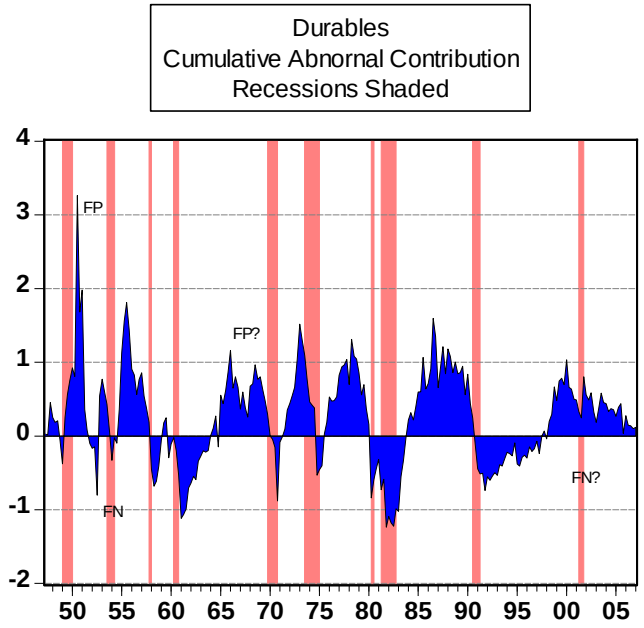
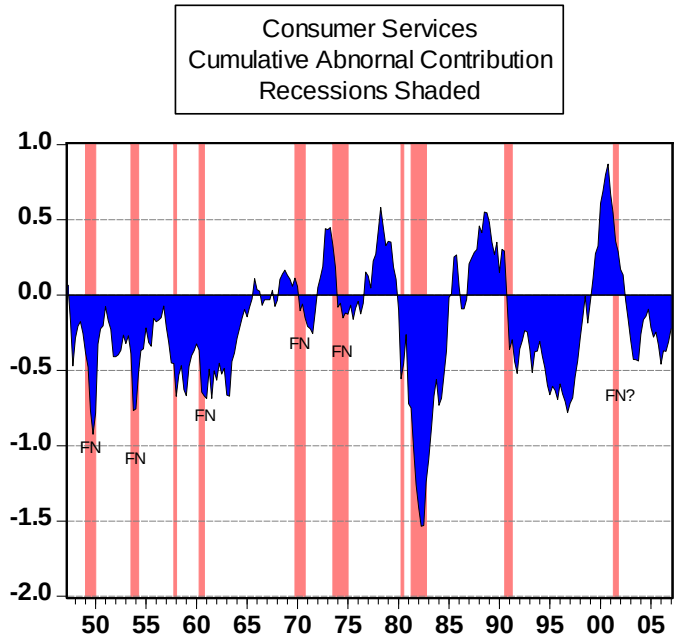


Figure 14 **Consumer Services: False Positives and False Negatives**



Multivariate Confirmation:
It's a Consumer Cycle, Not a Business Cycle

The graphs that we have just examined allow an "episodic" analysis of the data that records ticks of the clock by the occurrence of recessions and that allows each recession to have its own characteristics. Those desirable aspects of graphical inspections are offset by the two-dimension limitation of visual images. For high-dimensional analysis we are forced to process the data numerically. Table 4 reports a regression of GDP growth on all 1-quarter lagged contributions to GDP growth. This multivariate regression uses calendar time to record clicks of the clock and thus treats all recessions as similar in temporal structure. A dummy variable for years less than 1970 is included to account for the shift in mean of GDP growth at that time.

The explanatory variables are sorted by their absolute t-statistics, which measure the independent contribution of the component of GDP, controlling for all the other variables. So here it is again! ***It's a consumer cycle, not a business cycle.*** The top four contributions with significant t-stats are residential investment, consumer services, consumer nondurables and consumer durables. Business spending on equipment and software, structures and inventories do not contribute to the prediction of GDP growth in a measurable way.

It is not just the t-statistics that should attract attention. The coefficient on residential investment equal to 2 indicates that an unusual residential investment contribution to GDP growth in one quarter predicts twice as much contribution from some sector the next quarter. Consumer services, with a coefficient of 1.7, also has a multiplicative effect. All the other coefficients are less than one.

Oddly, the coefficient on consumer durables is negative, not positive. This should remind us that we are dealing here with partial correlations. Controlling for the strength in the economy as measured by the other variables, an abnormal surge in durables sales in one quarter steals sales from the next quarter, making it weaker than it would be otherwise.

The simple correlations are also recorded in the last four columns of this table, for coincident and lagged effects and for two subperiods: before and after 1970. The largest coincident simple correlations are for equipment and software, and for inventories. The lagged simple correlations for both of these variables are small. This confirms what we have seen in the graphs: drops in business spending occur during the recessions, not before. The largest lagged simple correlation for both subperiods is (you must know by now): residential investment, greater after 1970 than before.

If you need more evidence, take a look in the appendix at the probit models for predicting rising unemployment one quarter ahead based on the components of GDP (residential investment wins) and the probit models in Leamer(2007) for identifying the year before recessions based on the ten components of the Index of Leading Indicators(housing starts and the slope of the yield curve offer accurate predictions).

Table 4
Dependent Variable: **GDP growth**
Method: Least Squares
Sample (adjusted): 1947:3 2007:1
Included observations: 239 after adjustments

Contribution of:	Coefficient	Std. Error	t-Statistic	Simple Correlations: Coincident S1	Coincident S2	Lagged 1 Q S1	Lagged 1 Q S2
I_RES(-1)	2.00	0.28	**7.14**	0.39	0.56	0.41	0.56
C_SERV(-1)	1.70	0.42	**4.05**	0.40	0.30	0.28	0.46
C_NONDUR(-1)	0.79	0.29	**2.70**	0.32	0.46	0.26	0.31
C_DUR(-1)	-0.51	0.20	**-2.49**	0.47	0.57	0.13	0.28
GOV_FED_DEF(-1)	0.31	0.17	1.75	0.19	0.11	0.00	-0.01
GOV_FED_NONDEF(-1)	-0.65	0.39	-1.66	0.00	0.02	-0.11	-0.09
GOV_STATE_LOCAL(-1)	-0.67	0.59	-1.13	-0.05	0.21	-0.09	-0.03
I_STRUCT(-1)	-0.56	0.57	-0.98	0.40	0.34	0.05	0.02
NX_X(-1)	0.22	0.24	0.90	0.07	0.37	-0.01	0.05
I_EQUIP(-1)	0.26	0.31	0.84	0.59	0.60	0.19	0.27
NX_M(-1)	-0.15	0.25	-0.60	-0.27	-0.44	-0.19	-0.30
I_INVENT(-1)	-0.02	0.09	-0.19	0.59	0.58	0.23	-0.11
C	0.57	0.56	1.03				
@YEAR<1970	1.00	0.50	**2.02**				

		S1	1947:2 1970:1
R-squared	0.37	S2	1970:1 2007:1
Adjusted R-squared	0.34		
S.E. of regression	3.30		
Durbin-Watson stat	2.15		
Mean dependent var	3.48		
S.D. dependent var	4.06		

Hormones and Housing: It's a volume cycle not a price cycle

> *The reason housing is so important in recessions is that homes have a volume cycle, not a price cycle.*

Now that we know how important housing is to the US business cycle, the next step is to try to figure out why. One very big clue is that housing has a volume cycle, not a price cycle. Home prices are very sticky downward, and faced with a decline in demand, it is the volume of sales that adjusts not the prices. With the decline in sales volume comes a like decline in jobs in construction, finance and real estate brokerages.

Don't forget that the P in GDP refers to production, and the appreciation of your home as you sip your chardonnay in your hammock in your back yard is not production and doesn't count as part of GDP. But jobs in construction, finance and real estate do count. Thus volumes matter for real GDP accounting, not prices. Prices can matter indirectly through a wealth effect, but be a little skeptical about this. Unless there is a change in the technology for transforming residential land into housing services the contribution of that land to GDP is about the same now as it was ten years ago or ten years hence.[7] When we book the greatly appreciated land value as an asset for the homeowners, we should be booking the same appreciation as an exactly offsetting liability for future homebuyers.

John Muelbauer's paper in this same volume raises another important avenue through which home prices can affect spending – the easing of credit market access for homeowners. Whether this affect can be associated with a recession remains doubtful for me.

But what is crystal clear is that the stickiness of home prices is a big problem for home volumes. Normal sales volumes occur when buyers are confidant that home prices are likely to increase at normal rates, or at least not go down. As I write these words, there are many localities that have very reluctant buyers thinking about getting better deals by waiting. If prices could quickly reequilibrate when the housing cycle turns down, then normal appreciation and normal sales volumes would quickly reappear. But the sluggishness of price adjustments is what makes the volume cycle so extreme, and what makes housing so important in recessions.

Sales Prices and Volumes of Existing Homes in the LA Market

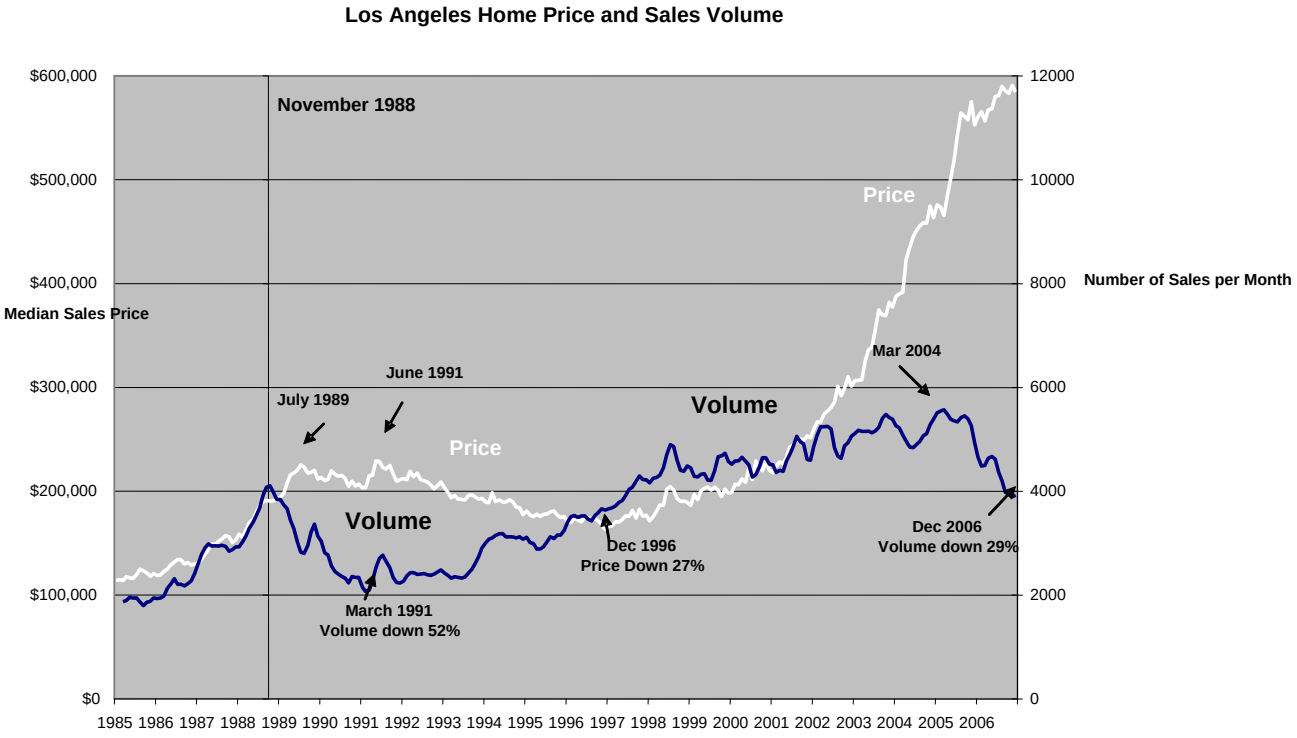
The persistence of high prices of existing homes in the face of a market decline and a sharp drop in volumes are very evident in Los Angeles in the early 1990s. Figure 15 illustrates the median sales price and the volume of sales of existing homes in Los

[7] Per the Hotelling rule, the (unimproved) value of land should increase at the real rate of interest.

Angeles. Here we can see the sharp run-up in both prices and volumes from 1985 to 1989. The sales volume peaked in November 1988 and fell by 50% in a year and a half. But price appreciation continued for almost a year until July 1989, and then, even with the sales rates at half the previous level, prices simply leveled off, until a year later in June 1991, when prices began an ever-so-slow decline, reaching their low point four and a half years later in December 1996, declining at roughly 5% per year, down a total of 27%. Had you purchased at the peak price in June of 1991 it would have bothered you that the same median sales price occurred almost a decade later in April 2001.

It's a volume cycle not a price cycle. And it's starting again. The December 2006 volume is off 29% from the peak in March 2004, and prices are leveling off, but not declining. (so far)

Figure 15 Los Angeles Home Prices and Sales Volumes (Existing and New Homes)



New Homes Nationwide Have a Volume Cycle, Not a Price Cycle, Too.

Though builders are more motivated sellers than existing home owners, for new homes too, it's a volume cycle, not a price cycle.

Sales of new homes in four US regions from 1973 to April 2007 are illustrated in Figure 16 with US recessions shaded. Each of the four panels here includes a trend line and a

±20% band around that trend line, wide enough to capture most but not all of the variability.

A hot housing market from 2000 to 2006 pushed sales rates of new homes toward and above that +20% line in all regions. The last time the market was so strong was in the 1970s when sales of new homes in all regions but the Northeast floated well above that +20% band. That 1970s housing market crashed in the double dip recession of the early 1980s, when sales volumes in all four regions dipped well below the -20% line.

A substantial dip in sales occurred in the other two recessions in this picture, the 1990/91 and 1974/75 events. The only recession of the ones illustrated in which sales did not dip below the normal band was the 2001 "business downturn."

A somewhat different image of the housing cycle comes from an examination of housing units started, Figure 17, which is a longer time series and includes both single-family and multi-family dwellings. The trends in total units started are all less than the trend in single family homes, reflecting the shift in mix in favor of single family dwellings. For example, the Northeast has a substantial -1.2% per year negative trend for total starts compared with a -0.1% trend for single family homes. All four regions have experienced a sharp reduction in housing starts, back to the 2000 levels in three regions, and much beyond in the very hard-hit Midwest where so many manufacturing jobs were lost in the 2001 recession, and never found again.

Never mind, you are thinking. It isn't whether you can sell your home that matters. Sales volumes matter to your real estate broker and your title company, but not to you. That's their jobs and their incomes at risk. For you, it's the price. It's the well-being that comes from knowing that your home is "worth" twice as much as you paid for it. Might as well celebrate and buy another SUV. Sorry, better think again. The price of homes also varies, but in a way different from sales. For one thing, the price trails the sales volume. Remember that: "First comes volume, and then comes price." Something else to remember: the volume cycle is more extreme than the price cycle. It you want to simplify and exaggerate, just say "It's a volume cycle, not a price cycle."

Figure 18 illustrates the real prices of new homes sold in the same four regions, with trend lines and with ±10% bands. We needed the wider ±20% bands to capture most of the ups and down in sales volumes. Thus the cycle in volume is twice as amplified as the cycle in price. Figure 19 illustrates the corresponding nominal prices.

The reluctance to sell into a weak market can keep nominal prices high, but real prices erode because of general inflation. The wiggles and waves in the real prices illustrated in Figure 18 are caused by the ebb and flow of the race between home prices and the CPI. Real prices of homes decline when a housing time-out holds nominal prices fixed for several years, letting inflation of the CPI make the home less valuable in real terms. Using nominal prices, it really is a volume cycle, not a price cycle.

Take a look again at the real prices in Figure 18. The South, where all that building is going on, has a lower real appreciation rate (1.1% per year) and the most stable prices, staying pretty steady inside the ±10% band. The Northeast, where little building is occurring, has the highest real appreciation rate (2.0%) and rather volatile prices. That gives a hint about housing markets. It's not the structure that has a volatile price; it's the land. Where there is plenty of buildable land, the response to an increase in demand for homes is mostly to build more, not to increase prices. Where there is little buildable land, the response to an increase in demand for homes is mostly a price increase, sufficient to discourage buyers enough to reequilibrate the supply and demand.

Fixed Price Stories

If the notion that your home can fall in value troubles you, ignore the discussion of the real prices illustrated in Figure 18, and focus instead on Figure 19, which illustrates nominal home prices, unadjusted for inflation. Here you can comfort yourself with the thought that home prices never go down; well almost never, and if they do, the decline is not very much. There's a reason for that. We love our homes. We don't love our investments in General Motors or IBM, and when the stock market sends us the daily message that share prices have plummeted, we reluctantly accept that unwelcome reality. Homes are different. We have a close personal relationship with our homes. When the market is hot, buyers stream by our front doors proclaiming that they love our homes even more than we do by offering prices beyond our wildest dreams. Charmed by that flattery, many of us sell our loved ones, confidant that we have turned our homes over to people who will treat them well. Thus rising prices and high sales volumes. When the market cools, however, only a few prospective buyers come to our front doors, and those prospective buyers bring a most unsettling message: "We know you love your home, but it isn't worth nearly as much as you think." That can be a deal-breaker for female owners, but the clincher for males is the fact that their idiot neighbor sold his home for $1 million just last year, and the male owner is not going to take a penny less than that. It doesn't matter what the market thinks. This house is worth $1million. Period.

Housing hormones, both estrogen and testosterone, make owners very unwilling to sell into a weak market and that unwillingness tends to keep the prices of homes actually sold high while greatly reducing the volumes of homes sold. What we observe are not market prices but sellers' prices.

If you don't like this love story, another good one is that sellers look backward, remembering what they or their neighbors paid, but buyers look forward, wondering what the house might be worth in a couple of years. Positioned in time looking in different directions, when the market is rising, owners estimate the value less than prospective buyers, and a sale occurs, but when the market is falling, the owners remember the good old days of high prices, and the buyers are thinking about a better deal in a couple of months. Then there is no transaction, unless it is at the high sellers prices. A third story comes from the behavioral economics: It's loss aversion.[8] As long as I don't sell my home, I can comfortably maintain that it is worth what I paid for it.

[8] For strong evidence of this in the Boston condo market see Genevose and Mayer (2001).

Of course, economists have no room in their models for love, hope, or the psychology of loss, and they may prefer an options story why sellers have high reservation prices during weak markets[9]. A seller would turn over not only the right to live in the house but also the option to sell in a year or two when the market might be stronger. Timing preferences and transactions costs may make that option much more valuable to the current owner than to prospective buyers. An owner may be ready or even eager to move in a couple of years, but buyers may generally be committed to longer horizons for their next move. In addition, buyers would have to pay two transactions fees to exercise that option including both the brokers' fees and the huge costs of an otherwise unwanted change in residence, while owners pay only the brokers' fees (since they are planning on moving anyway) and only once. With a high value of the option for the owner and a low value for the buyer, no transaction occurs.

[9] e.g. Cauley and Pavlov(2002,2007), Pavlov and Wachter (2001) which consider the option to walk away from a non-recourse loan.

Figure 16 Sales of New Homes by Region, Recessions Shaded

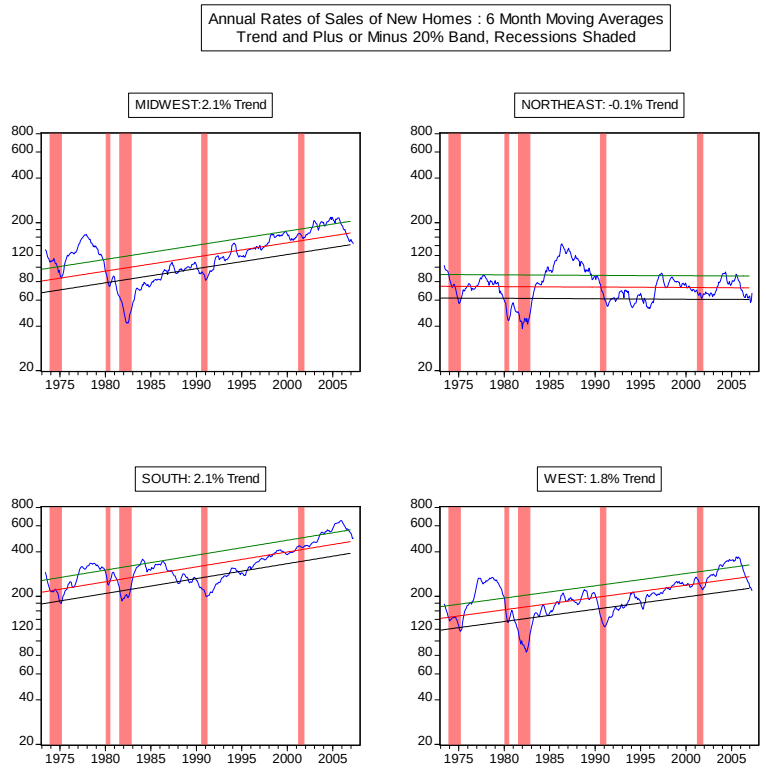


Figure 17 Housing Units Started, Single Family and Multi-family

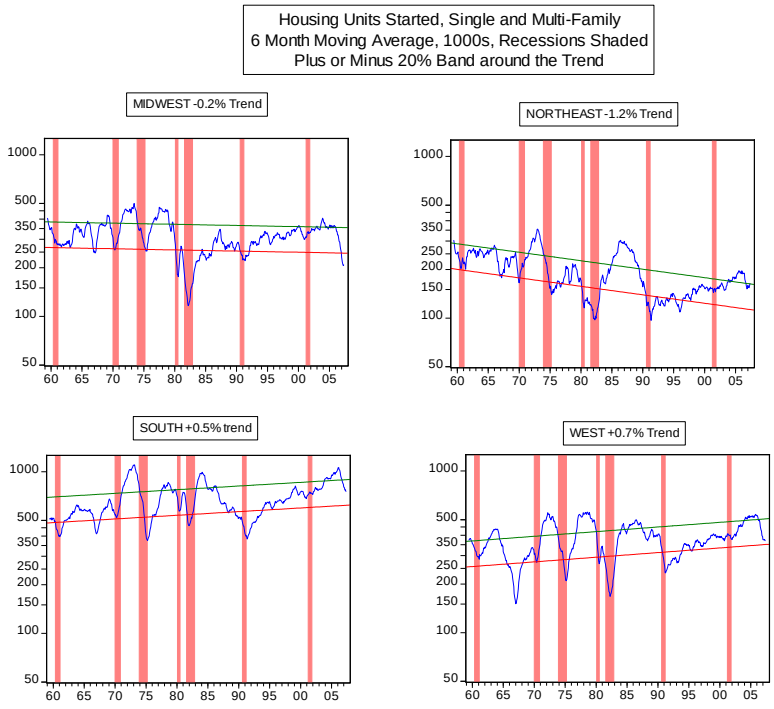


Figure 18 Real Prices of Homes Sold

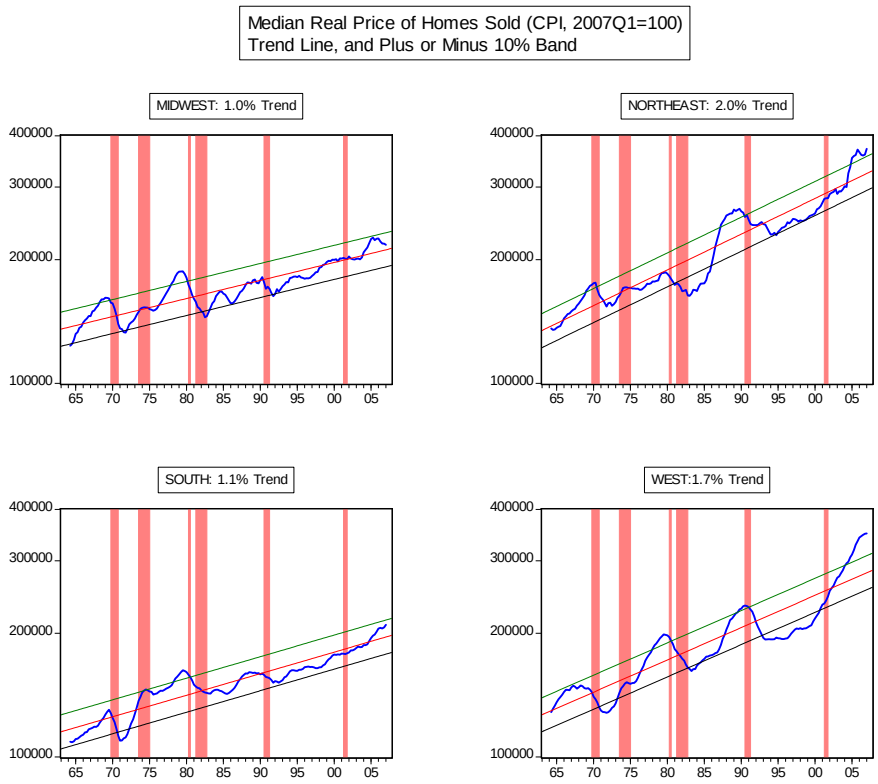
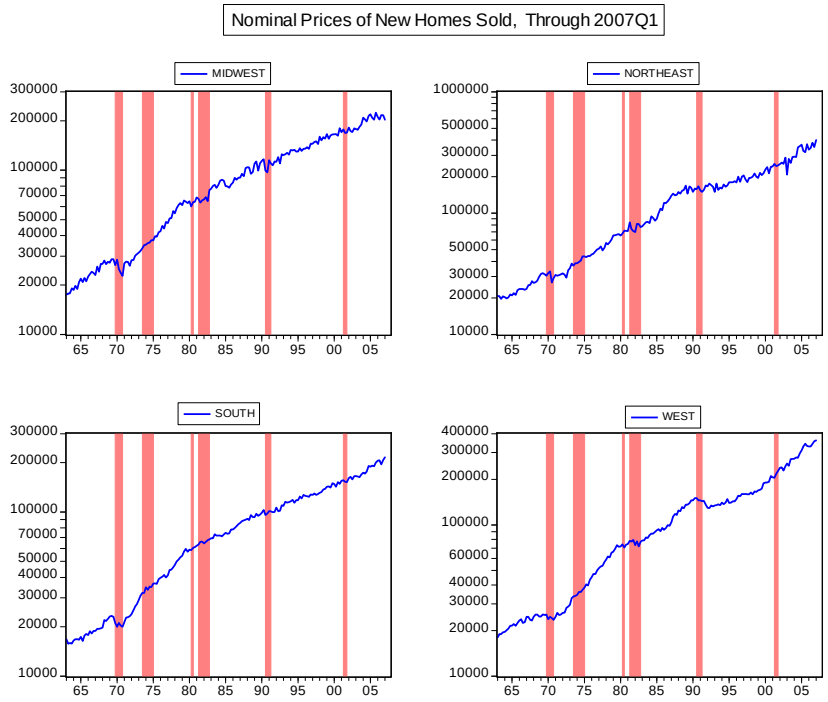


Figure 19 Nominal Home Prices



The Phases of the Housing Financial Cycle: Hope, Hype, and Havoc

A symptom of a housing market gone astray is greater appreciation for the cheaper properties.

The damage done by rapidly elevating unemployment is very apparent, but it's not just pink slips that are handed out during recessions. It's also notices of delinquencies and foreclosures. Both the pink slips and the foreclosure notices are given disproportionately to the poor and the young, often to the very same families. We don't need to shed many tears for the get-rich-quick artists who back out of their options-to-buy investment properties when values go south, but a foreclosure is an undeserved slap in the financial face of the hardworking Americans who thought they could afford their homes because they qualified for the loans, only to realize later that the lender was expecting the home to pay for itself through continued appreciation. Beyond limiting the damage unemployment does to working Americans, attenuation of the housing financial cycle is likely to reduce the financial damage done to the lifetime budgeting of many lower-middleclass Americans.

This time more than before it has been self-collateralizing loans and relaxed underwriting standards that have allowed borrowers with weaker credit histories and lower ratios of income to qualify to buy home at inflated prices late in a housing expansion. In this section I report circumstantial evidence of these problems gathered from a study of prices of homes sold in Los Angeles from 1988 to 2006. I use this data set to explore two possible consequences of the financial housing cycle. [10]

1. The financial cycle may be experienced disproportionately by low-income first-time buyers. [11]
2. The idiosyncratic risk may be greatest for the homes bought at the peak of the mania, many by low-income first-time homebuyers.

As is demonstrated below, the greatest appreciation in Los Angeles during the hot years of 2003-2005 occurred in low-priced zip codes and for smaller homes. The correction is occurring as I write and it is too soon to say for sure, but the evidence to date suggests that the same homes that had the happiest of times in the hot years are having the saddest of times in the correction.

What I thought I would find regarding idiosyncratic risk turned out not to be the case. The idiosyncratic risk is the part of the house appreciation that is not explained by market appreciation during the periods when the home is owned. This idiosyncratic risk comes from buying and selling acumen (including the choice of location), and from changes in

[10] By focusing on the cyclical aspects of housing finance and the impact on family balance sheets, I am hoping not to overlap much with Susan Wachter's paper in this volume, "The Housing Finance Revolution," or with Robert Shiller's, "Understanding Recent Trends in House Prices and Home Ownership."

[11] Vacation homes and investment homes purchased by the wealthy are also highly cyclical.

the property between purchase and sale. It is surprising large with a standard deviation of roughly 30%. And you complained about that 6% that accrues to the real estate brokers! Though very large, it is also very constant and doesn't seem to move with the financial cycle.

A story of the financial cycle

Before looking at the data, first a story about the financial cycle. Paul McCully(2007) has insightfully applied Hyman Minsky's(1986) theory of the financial cycle to housing.[12] Minsky identifies three types of loans: hedge finance, speculative finance and Ponzi finance. Hedge loans support the acquisition of assets with current profits sufficient to cover the interest charges and amortize the debt. Speculative loans back assets with current profits enough to cover the interest charges, but these loans require growing profits to pay down the debt. Ponzi loans back assets with current profits too low even to cover the interest charges.

Substitute "income" for profits to get a story of the housing financial cycle.[13] In the first phase of the housing financial cycle, after a recession, heightened lender concerns about risk allow homebuyers to qualify for loans only if they have income levels high enough both to service the debt and amortize the loan – that's hedge financing.[14] Later, after the period of heightened risk avoidance turns to normal risk concern, loans are given to buyers who can afford to pay the interest but who must rely on rising incomes or rising home values or falling interest rates to amortize the debt – that's speculative financing. Next, after a period of prosperity and rising home prices, lenders forget all about risk, and loans are given to buyers whose incomes are not enough even to service the debt – Ponzi financing. Ponzi borrowers who qualify on the basis of teaser rates or negative amortization rates face a reset/recast reality that can be dealt with only if their homes appreciate in value.

Evidence of Diminished Underwriting Standards: Appreciation Greatest for Cheaper Homes

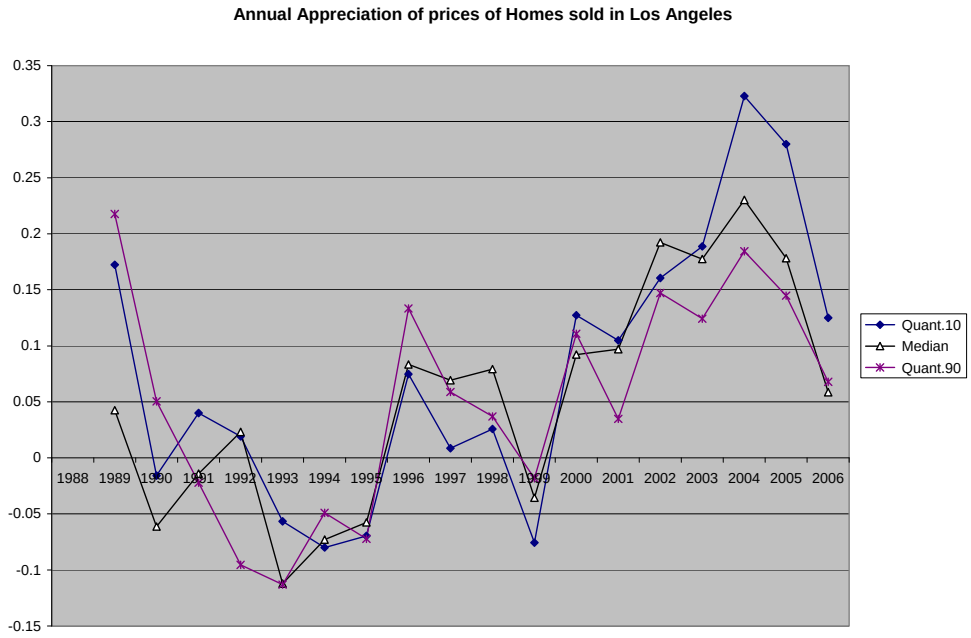
Evidence of the financial cycle can be gathered from the sales records of homes in Los Angeles before and during the bubble years of 2003-2005, when greatly relaxed lending standards for both Subprime and Alt-A mortgages increased the number of Americans qualifying for mortgages.

To explore the impact of these relaxed lending standards on home prices, I will make use of a data on purchase and sale combinations for homes sold in Los Angeles from 1988q1 to 2006q4, collected by Dataquick. One way to try to determine if the low-priced and high-priced homes are experiencing different rates of appreciation is to contrast the movement over time of the median sales price with the prices at the 10^{th} and 90^{th} percentiles. Figure 20 illustrates the appreciation rates based on these percentiles. Notice

[12] See also Herring and Wachter (2002).
[13] If home-owning is treated as an investment, then the analogue of business profits is owner-equivalent rent.
[14] Do you remember the note-burning parties of an earlier generation of Americans?

that it is the 10th percentile that had the highest appreciation in the period with relaxed underwriting standards, 2004-2005. In the earlier high appreciation period in 1988-89, it was the 90th percentile that experienced the greatest appreciation.

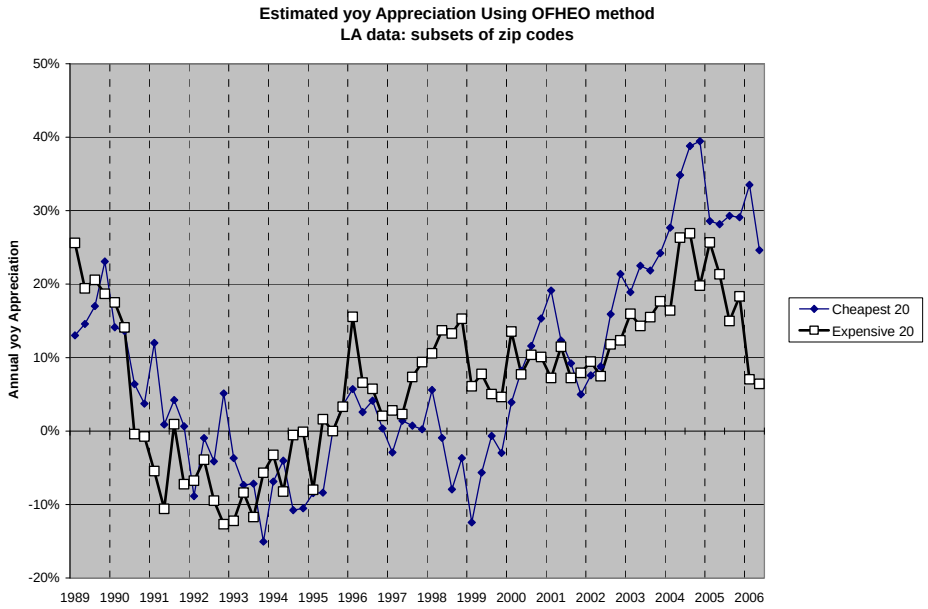
Figure 20 **Appreciation by Percentile from Transactions Data**



The appreciation rates computed from transactions prices can mislead when the mix of homes sold changes over time, and when the median homes, 10th percentile homes and 90th percentile homes are not roughly the same over time. A method to estimate market prices that doesn't suffer from this problem of changing mix was pioneered by Case and Shiller(1987) and is now used by OFHEO and by Case-Shiller to compute home price indices for a large number of cities, for states and for the US overall. Estimates of the quarterly rates of appreciation are found by regressing the logarithmic same-house price difference on dummy indicators turned on if the home was held in the quarter selected by the dummy. The coefficients in this regression are the estimated appreciation rate, quarter by quarter. See Table 8 in the Appendix.

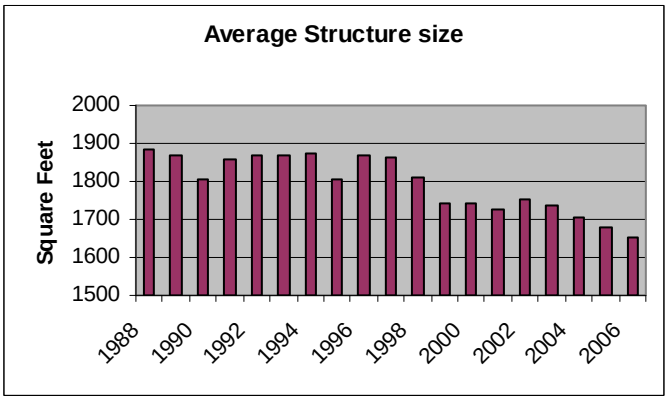
To separate the appreciation rates of high priced homes from low-priced homes, this exercise has been conducted separately for the 20 zip codes with the lowest median price and the 20 with the highest. This produces the appreciation rates displayed in Figure 21. Clearly, the appreciation was greatest for the cheaper zip codes in the hot market from 2003 to 2006, though this is mostly an offset to a weak market from 1996 to 2000.

Figure 21 **Estimated Appreciation Rates: Expensive and Cheap Zip Codes**



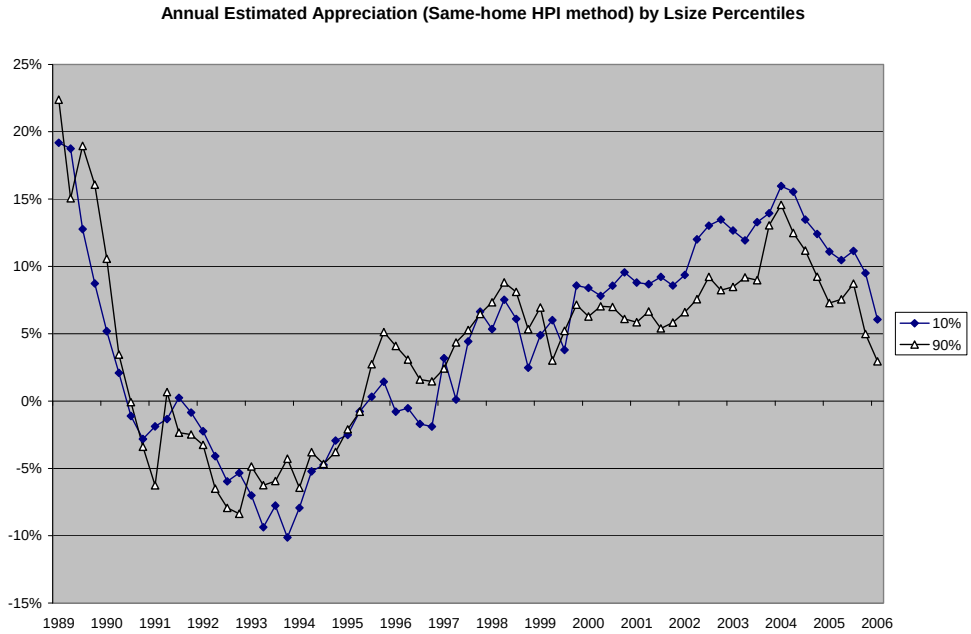
Another way to separate the high-priced from the low-priced homes is by size of the structure. The data set includes the square footage of the home, and it is interesting that that average square foot of homes sold in LA fell a lot in the go-go years. This may be evidence of a shift toward condos or toward transactions involving smaller homes.

Figure 22



We can add to the Case/Shiller regression interactions between the log of structure size and the period dummies to allow the appreciation in each quarter to depend on structure size. Then, using this estimated equation, we can compute the estimates of the appreciation at the 10^{th} percentile and 90^{th} percentile of structure size displayed in Figure 23. Consistent with the finding on zip codes, it was the smaller homes (condos?) that had the greatest appreciation in 2000- 2006, the opposite of 1988-1989.

Figure 23

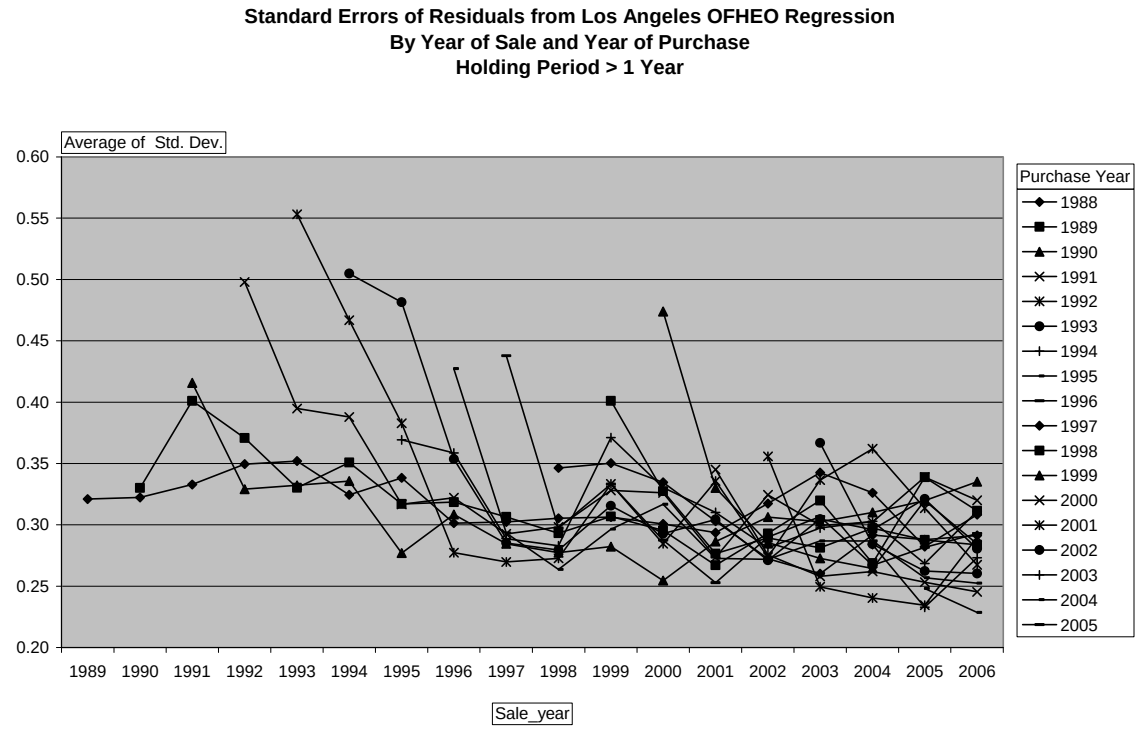


(Non-) Evidence of Diminished Underwriting Standards in Idiosyncratic Risk

The next item on the agenda is the idiosyncratic risk. A measure of this risk is the residual standard error (0.308) in the Case/Shiller regression. That means that after controlling for the periods in which the home was owned and experiencing the overall market appreciation, the standard error of the realized appreciation was 30%, a very large amount of idiosyncratic risk.

Figure 24 illustrates the standard errors of the residuals from the OFHEO regression reported in Table 8 by year of sale and year of purchase. The briefer holding periods offer higher rates of return also come with larger standard errors. But once the holding period gets to several years, the residual standard error hones in on that 30% figure. I imagined that transactions with either a sale year or a purchase year in the hot interval from 2003 to 2005 would have greater idiosyncratic risk, but this risk actually seems rather stable. Very large but not very cyclical.

Figure 24 **Idiosyncratic Risk by Year of Purchase and Year of Sale**



The Conflicts between Housing and Inflation Targeting

I take it as demonstrated that housing plays an extremely large role in the US business cycle, and I take it as clearly implied that the business cycle would be less frequent and less severe if the housing cycle were less frequent and less severe. Though I understand that housing has not been a direct target of monetary policy, we can still ask if the historical policy choices have amplified or attenuated the housing cycle and we can ask what monetary policy might have been implemented if attenuation of the housing cycle were the only goal of the Fed.

Homes and Consumer Durables Create Special Control Problems

The traditional fixed-wage theory of unemployment and recessions needs to confront two important facts:

1. The early warning signs of a coming recessions are weakness in homes and consumer durables.
2. Most of the job loss in US recessions comes in construction and durable manufacturing.

Why these two sectors? Both durable manufacturing and residential construction have four special features:

1) Previous production of new homes and cars create a stock of existing assets that compete with current production.
   Long periods of unsustainably high levels of sales of new homes and cars that increase the existing stocks beyond equilibrium levels inevitably give rise to long periods of low levels of sales to bring the stock back to equilibrium. Conversely, the low levels of sales of homes and cars characteristic of most recessions create "pent-up" demand, which is met by high levels of production and sales in the recoveries after the recessions.
2) The service flow from the existing stocks of homes and cars is psychically very elastic and the ability to postpone the acquisition of new cars or new homes is very great.
   You can still get from point A to point B in that ten-year old car, and it wouldn't be so bad to have your mother-in-law live with you, at least temporarily, would it?
3) The price of durability is the real rate of interest.
   If the real rate of interest is low, the equilibrium stock of homes and cars is high. When the real rate of interest falls permanently, production of homes and cars has to greatly exceed the normal levels in order to bring the existing stocks up to their new equilibrium levels. But if consumers discover that the reduction in the real rate was only temporary, production and sales have to fall below normal levels to allow the stock to revert to it's appropriate equilibrium.

4) The asset prices of both homes and new cars suffer from downward price rigidities, for different reasons.

    Slow and predictable erosion of the asset prices causes low levels of production even if the (implicit or explicit) rental markets for existing homes and cars are crying out for more. That, by the way, is where deflation is a big problem, not deflation of rental rates or deflation of prices for nondurable goods and services but rather deflation of asset prices of existing stocks of durables in the face of a strong rental markets.

Here is the message from these four bullet points: Management of sales of homes and consumer durables by either businesses or monetary authorities is a difficult *intertemporal* control problem, with decisions made today affecting the range of options in the future. If we choose to stimulate today, tomorrow our ability to stimulate will be less.

With the mortgage market collapsing around us in 2007, this should be pretty clear. Normally, in a recession, sales of homes and durables are too low to maintain stocks at desired levels, and following a recession, low interest rates transfer sales forward in time, capturing sales that had not occurred during the preceding recession. The 2001 recession was unique in that sales of both homes and durables held up well. With no lost-sales to transfer *forward* in time, the low interest rates in 2002 – 2004 transferred sales *backward* in time, stealing sales that otherwise would have occurred in 2006-2009. In 2007 the housing sector of the economy is now paying the Piper with very little possibility that a rate cut would make much of a difference. Once the wave has peaked and is crashing, there is not much that can be done to quiet the waters.

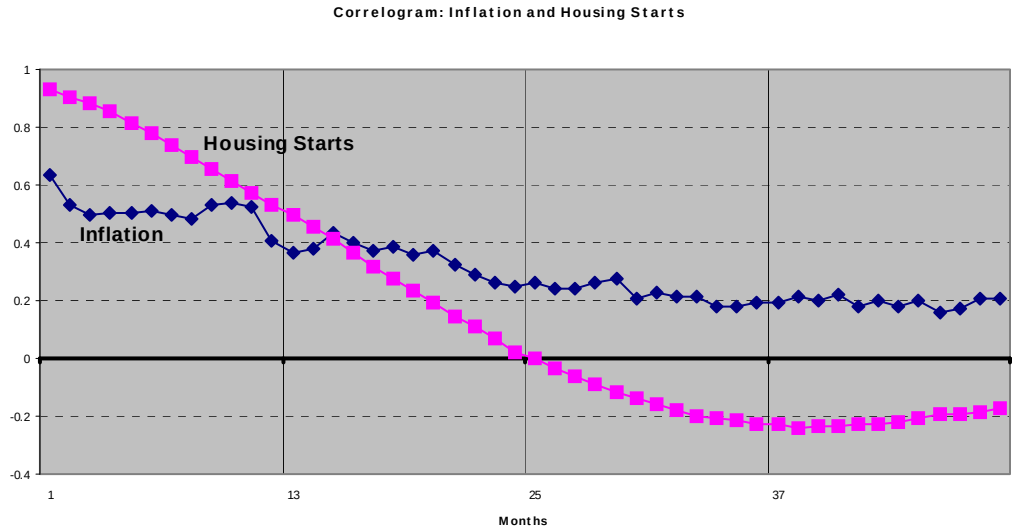
Inflation is Persistent, But for Housing, It's the Cycle that's Persistent

A good way to contrast the control problems for inflation with the control problems for housing is to examine the correlograms for inflation and housing starts illustrated in Figure 25. A correlogram for a time series, x(t), is the set of lagged correlations, x(t) with x(t-1), x(t) with x(t-2), x(t) with x(t-3) and so on.

Figure 25 reveals that the correlation of CPI inflation with CPI inflation in the previous month is 0.63. As the months become more separate the correlation slowly declines, but is still 0.2 after four years. That's a very persistent time series – once inflation gets going, it tends to hang on for a long time. This is understood by our monetary authorities who are quick to stamp out the inflation fire before it gains a foothold.

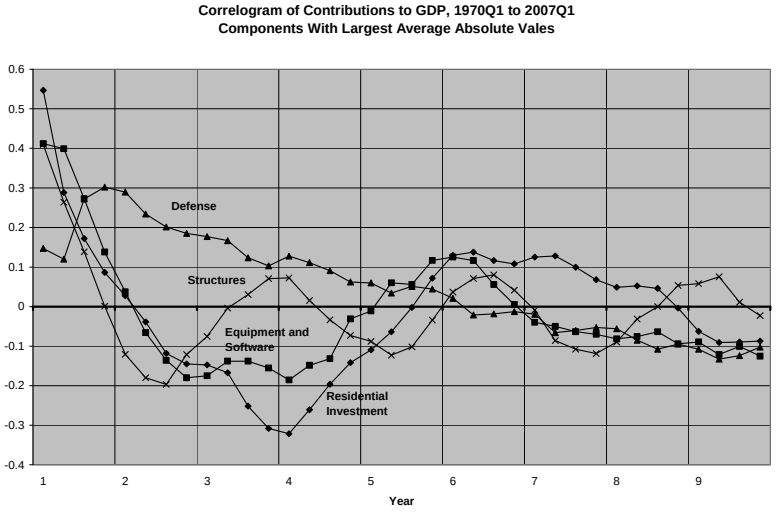
The correlogram for housing starts is very different. The correlation of housing starts with housing starts in the previous month is the very high number, 0.93. The correlation rapidly decays to zero after two years (24 months) but then it turns significantly negative, roughly –0.2 at 36 months. That's the correlogram of a cycle. *For housing, it's the cycle that is persistent*. Once the wave of homes gets going, the system transmits that wave, up and down, far into the future.

Figure 25 **Monthly Correlogram, Inflation and Housing Starts**



Residential Investment is not the only component of GDP with a long string of negatives in the correlogram. Figure 26 illustrates the correlogram for the four contributions to GDP that have the largest average correlations. These are the components that present intertemporal control problems. It should not be a surprise that residential investment has the largest correlogram. The other three with large correlograms are defense, business structures and business equipment and software. Defense spending has a string of large negatives at eight to nine years referring to the defense cutbacks that inevitably follow defense buildups. (Or is that defense buildups that inevitably follow defense cutbacks?) It is unlikely that monetary policy could much affect the cycle in defense. But what about the other three? It seems promising that the correlograms of residential investment and equipment/software are similar in shape. That leaves open the possibility that the control of the residential cycle might attenuate the cycle in equipment and software. More comments on this issue will be made in the conclusion.

Figure 26 **Quarterly Correlogram, Contributions to GDP**

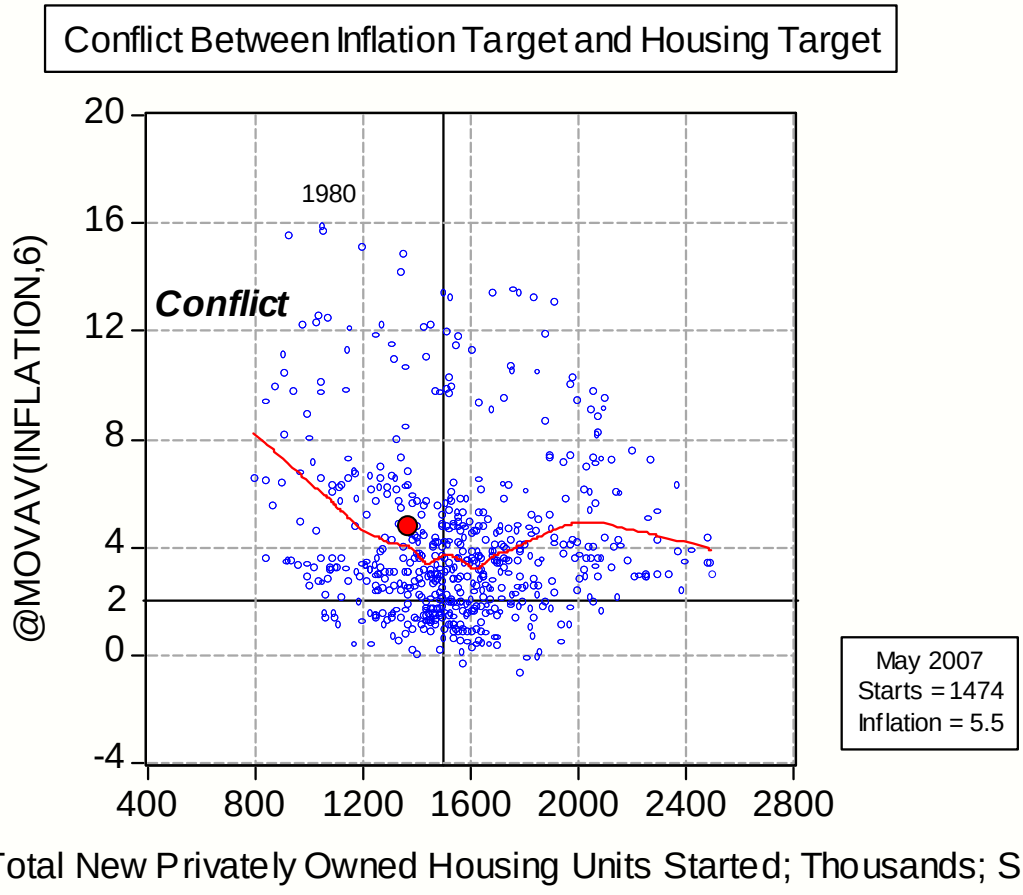


Policy conflicts among the targets: Inflation Unemployment and Housing

The three targets of inflation, unemployment and housing are not likely always to call for the same monetary policy. Figure 27 is a scatter of housing starts and smoothed inflation based on the overall CPI including food and energy. The axes are the historical average of housing starts and the hypothetical inflation target of 2 per cent. In this figure the northwest corner is the conflict area with weak housing calling for a rate reduction but high inflation calling for a rate increase.

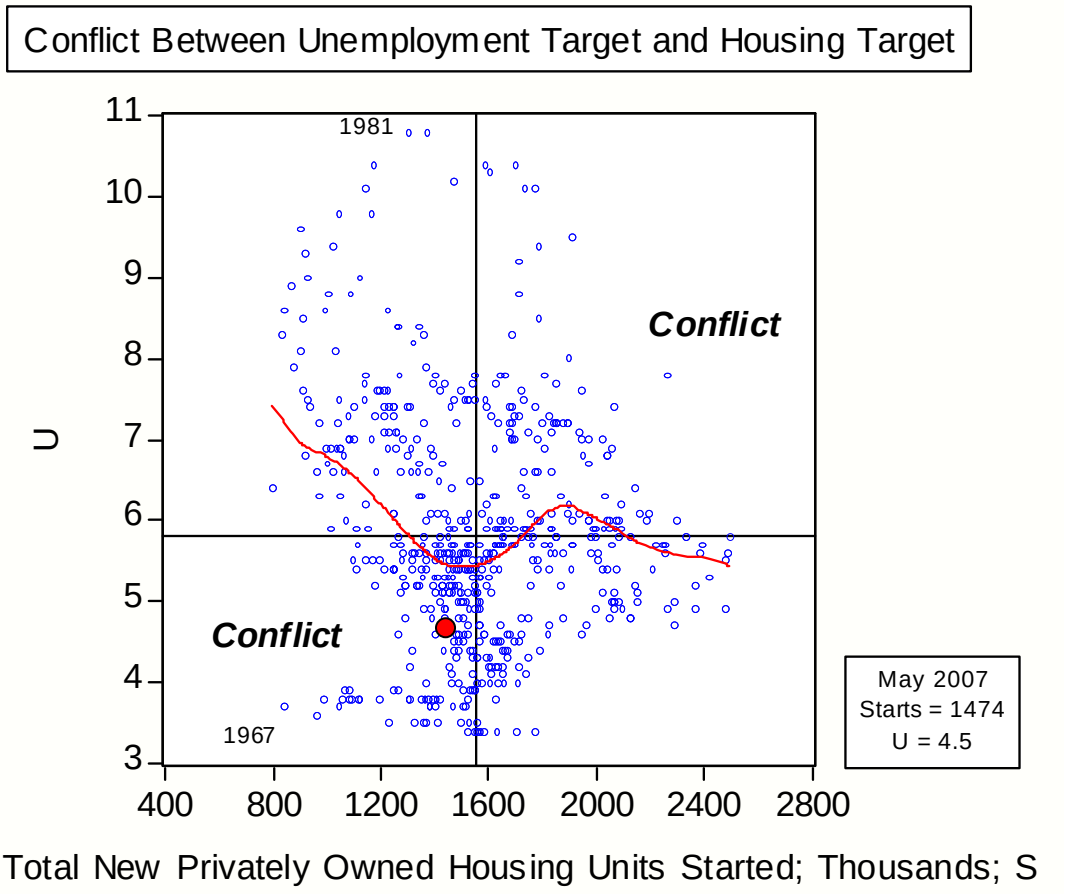
The year 1980 was about as bad as this conflict has ever been, but the slight negative correlation between housing and inflation when housing is weak means the US economy tends to create these policy conflicts with the highest inflation coinciding with the weakest housing market. As of May 2007, the large circle, we are not deep into the conflict area but we may be getting there, as housing continues to deteriorate and inflation persists and possibly worsens.

Figure 27 **Scatter of Housing Starts and Inflation**



Another potential target of monetary policy, unemployment, poses a different set of conflicts with housing, illustrated in Figure 28 with the horizontal axis at the average unemployment rate since 1959: 5.9. Here the conflicts occur when high levels of unemployment coincide with high levels of housing starts or when low levels of unemployment coincide with low levels of housing starts. The prominent role that housing plays in predicting recessions means that the conflicts between housing and unemployment are not great, except in 1967 when housing was very weak while the unemployment rate was very low. But-for the Vietnam War, it seems likely that unemployment would have been greater and would have been rising at that time, thus eliminating the conflict. In any case, a stimulus for housing wasn't needed when DOD spending was so strong. Thus the conflicts between an unemployment target and a housing target seem pretty minimal, except that the pursuit of low unemployment does not necessarily remind us of the housing intertemporal control problem: you can stimulate now or later, but not both. The Keynesian framework in which unemployment is a centerpiece has no such intertemporal conundrum.

Figure 28 **Scatter of Housing Starts and Unemployment**



Estimated Regressions for the Fed Funds Rate and Housing Starts

Some estimated regressions that explain the Fed Funds rate and housing starts are useful for further discussion of a housing target. Of the many models that might be estimated, these are only examples, so don't take them as literal truths.

The regression explaining movements in the Federal Funds rate reported in Table 5 creates a horse race between long-term interest rates, inflation, housing starts and unemployment, all trying to explain the movements in the Fed Funds rate since 1959, the starting point for the housing starts data. The negative coefficient on the lagged Fed Funds rate is the regression-toward-the-mean effect. The positive coefficient on the lagged change in the rate is a momentum effect.

In this regression, the coefficients other than the lagged Fed Funds rates are made comparable by standardizing each variable by dividing by its standard error. Thus these coefficients answer the question: by how many basis points is the Fed Fund Rate changed when a variable increases by one standard deviation.

This horse race is won by the bond market. It's the level and change in the rate on 10-year Treasuries that best explains changes in the Fed Funds rate, measured either by the t-statistics or the size of the coefficients.

Unemployment nudges out inflation for second place in this race. Last to the finish line is housing starts, with a low t-statistic and a small coefficient. But we knew that, didn't we. The Fed hasn't cared much about housing starts, has it?

Table 5 Equation for the Change in the Federal Funds Rate

Dependent Variable: D(RATE_FF)
Method: Least Squares
Sample (adjusted): 1959M10 2007M05
Included observations: 572 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.37	0.80	-1.70	0.089
RATE_FF(-1)	-0.10	0.02	-5.69	0.000
D(RATE_FF(-1))	0.28	0.04	7.02	0.000
RATE_10Y(-1)/@STDEV(*)	0.27	0.06	4.29	0.000
D(RATE_10Y(-1))/@STDEV(*)	0.13	0.02	5.80	0.000
@MOVAV(INFLATION(-1),12)/@STDEV(*)	0.12	0.03	3.86	0.000
@MOVAV(LOG(STARTS(-1)),3)/@STDEV(*)	0.04	0.02	1.97	0.050
U(-1)/@STDEV(*)	-0.11	0.03	-3.27	0.001
D(U(-1))/@STDEV(*)	-0.08	0.02	-3.74	0.000

R-squared	0	Mean dependent var	0.003
Adjusted R-squared	0	S.D. dependent var	0.572
S.E. of regression	0.48	Akaike info criterion	1.389
Sum squared resid	130.2	Schwarz criterion	1.458
Log likelihood	-388.3	F-statistic	30.481
Durbin-Watson stat	1.9	Prob(F-statistic)	0

If the Fed did care about housing starts, the housing starts regression reported in Table 6 might help to formulate some plans. Here we see a long and complex dynamical model with housing starts two-three years ago affecting this month's starts in a negative way.

The financial variables that cool housing starts are a high real rate of interest, rising long-term rates and an inverted yield curve. I use this regression to justify a focus on the slope of the yield curve as a measure of monetary tightness. In this focus on the slope of the yield curve, we have to worry again whether this is a predictive effect or a causal effect. This depends on the power of the narratives.

There is a very good predictive narrative. Few would buy a long-term Treasury paying less than a short-term Treasury unless economic weakness was expected when long-term rates will be lower, providing a capital gain to those who lock in the high rate now. An inverted yield curve is the bond market's way of forecasting economic weakness ahead.

There is a very good causal narrative also. The banking sector makes intermediation profits by taking deposits at short-term rates and making loans at long-term rates. When the yield curve is steep, every loan has built into it a substantial intermediation profit cushion, which makes delinquency and default risk less important. But when the yield curve flattens, or, even worse, inverts, the intermediation cushion disappears and banking operations switch from pushing loans onto anyone who can crawl off the street to making

sure the borrowers are credit-worthy. That's a credit crunch, with many potential homebuyers denied mortgages on their homes of choice.

This time, things were supposed to be different.[15] This time we would not get a credit crunch because we now allow Internet-based no-doc loan applications based on falsified income and borrowed credit scores, and because, through the magic of diversification via securitization, loan approval has been done by a what-me-worry bond market completely indifferent to delinquencies and foreclosures. This time there would be no credit crunch.

But this time was not different. The Federal Reserve Board and very stubborn buyers of 10-year Treasuries teamed up to give us an inverted yield curve, and the subprime meltdown followed soon thereafter, precipitating elevated loan standards across the board.

Table 6 Equation for Housing Starts

Dependent Variable: LOG(STARTS)
Method: Least Squares
Sample (adjusted): 1962:01 2007:05
Included observations: 545 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.784	0.179	4.4	0.00
LOG(STARTS(-1))	0.681	0.037	18.2	0.00
@MOVAV(LOG(STARTS(-2)),6)	0.267	0.039	6.9	0.00
@MOVAV(LOG(STARTS(-25)),12)	-0.054	0.020	-2.8	0.01
(RATE_10Y(-1)-RATE_FF(-1))/RATE_10Y(-1)	0.060	0.014	4.4	0.00
RATE_10Y(-1)-RATE_10Y(-13)	-0.018	0.003	-5.7	0.00
RATE_10Y(-12)-@MOVAV(INFLATION(-13),12)	-0.005	0.002	-3.0	0.00

R-squared	0.89	Mean dependent var	7.33
Adjusted R-squared	0.89	S.D. dependent var	0.21
S.E. of regression	0.07	Akaike info criterion	-2.41
Sum squared resid	2.80	Schwarz criterion	-2.35
Log likelihood	663.0	F-statistic	710.2
Durbin-Watson stat	2.2	Prob(F-statistic)	0

[15] Peek and Wilcox(2006) explain the part of the reduced volatility of US GDP growth to the growth in the secondary mortgage market. Whoops.

A Report Card Based on the Housing Target

Granted, housing has not been a Fed target, but we can still ask whether Fed behavior attenuates or amplifies the housing cycle. If we were feeling cheeky, we could even grade the Fed performance. In doing so, keep in mind that this is like having a Sociology professor grade an Economics exam. So don't be upset when the grades aren't that good. If we take inflation to be the target, the grades are much better.

The left-hand column of Figure 29 illustrates the relationship between housing starts and the tightness of monetary policy, measured by the slope of the yield curve (rate_10y – rate_FF) divided by the 10-year Treasury rate. Each figure applies to a different housing cycle, from trough to trough. The axes are the historical means of these variables, 1550 for starts and 0.16 for the spread divided by the 10-year rate.

Each figure includes a "sweet ellipse" in which housing and monetary policy are normal. The sweet ellipse has a downward orientation to reflect the fact that a tighter monetary policy should come with a hotter housing market. Two arrows on this ellipse indicate the direction a hypothetical cycle might traverse. Notice that at the average level of housing starts there are two different yield curves. When housing is expanding, moving to the right, contractionary policy is in place to keep the expansion from going too far, but when housing is contracting, expansionary policy is in place to keep the contraction from going too far. In other words, the housing control policy should depend on both the level and the direction of change in starts.

The right-hand column of Figure 29 illustrates the course of inflation over the same periods, measured by the two-year rate of increase in the CPI. This will keep reminding us that these grades are for an exam the Fed was not taking. The axis in the inflation graph is located at the presumed 2% target. The appropriate anti-inflation targeting has the same orientation as the sweet ellipse: contractionary monetary policy when inflation is high but expansionary policy with inflation is low.

1961 to 1966: In the 1961 trough in the first figure, stimulative monetary policy has produced a steep yield curve. This comes with improving housing starts, moving the economy into the "sweet ellipse" in which housing is normal and so is monetary policy. But tight monetary policy knocked the housing sector down and moved the economy substantially out of the sweet ellipse. *Housing grade: A in the first semester, F in the second.* But that the reason for that contractionary monetary policy can be seen in the inflation graph, where inflation is creeping upward in the mid-60s. *Inflation grade: A in both semesters.*

1966 to 1970: A shift from restrictive to accommodating gets housing back on its feet and moves the economy back into the sweet ellipse, but tight monetary policy soon enough kills off the housing sector and moves the economy back to a position again southwest of the sweet ellipse. The direction of the cycle is the opposite of the one recommended. At the 1500 level of starts, rates were more restrictive when housing was contracting than when housing was expanding. Again it was an ominous rise in inflation

that accounts for the contractionary policy. *Housing grade: A in the first semester, F in the second. Inflation grade: A in both semesters.*

1970 to 1975: Stimulative monetary policy got a housing recovery going and moved the economy back into the sweet ellipse, but further stimulation took housing to its all-time high. That party was terminated by rapid tightening of monetary policy which got housing back to normal, but monetary policy reversed course too late, and housing could not recover from its unfortunate downward momentum. That late-cycle stimulation came with a substantial increase in inflation from already high levels. *Housing grade: B for effort, D for result. Inflation grade: C.*

1975 to 1982: This loopy housing control is similar to the 1970 to 1975 loop, but not as extreme. Hardly any time was spent in the sweet ellipse. The second cycle associated with the double-dip recession in the early 1980s has the same problem as all the others – its moving in the opposite direction of the arrows on the sweet ellipse. *Housing grade: B for effort, C for result. Inflation grade: B.*

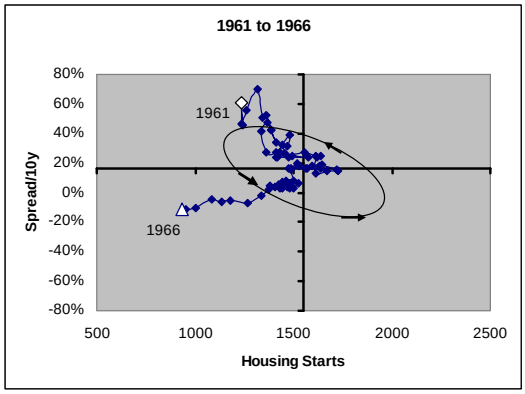
1982 to 1991: Here with a pretty average yield curve we got a significant expansion of housing that moved the economy back into the sweet ellipse and held it there for a very long time. Monetary tightening produced an inverted yield curve in 1989, which was tough on housing, and subsequent monetary loosening in 1990 was too little, too late. Inflation, meanwhile, was controlled by a mostly flat yield curve. *Housing grade: B+. You almost got it right. Inflation grade: A-. You really got inflation under control.*

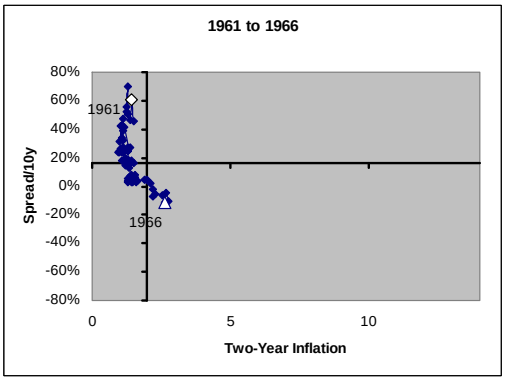
1991 to 2000: Expansionary monetary policy starting in 1991 and then a return to a normal yield curve got the economy back into the sweet ellipse, where it stayed until the very end. *Housing grade: A-. Great job; It would have been an A if monetary policy had been more neutral in 2000 when housing starts were weakening. Inflation grade: A. We finally wrung that persistent inflation out of the system.*

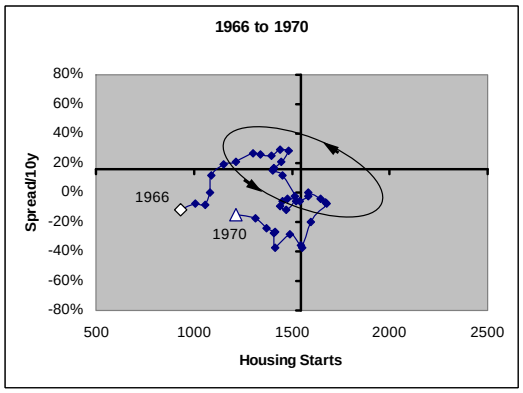
2000 to 2007: Highly stimulative monetary policy first moved the economy out of the sweet ellipse vertically and then housing got really hot and moved us farther from the sweet ellipse to the right. Housing ignored the return to a normal yield curve, but couldn't ignore the inversion in 2006, and we now find ourselves outside the sweet ellipse to the lower left, with a weak housing market and contractionary policy, when during most of the cycle we were outside the ellipse to the upper right, with highly stimulative monetary policy and a very strong housing market. *Housing grade: F. I am really disappointed in your performance. Inflation grade: This depends on what risks deflation entailed.*

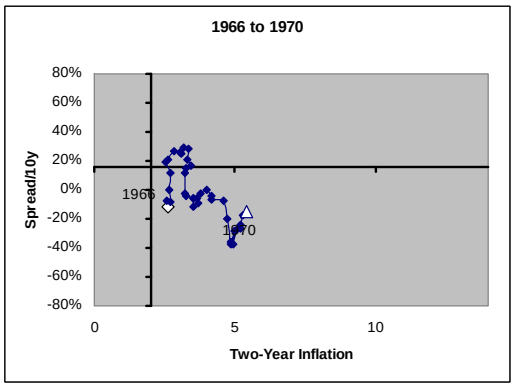
Figure 29 **Housing Starts, Inflation and the Slope of the Yield Curve**

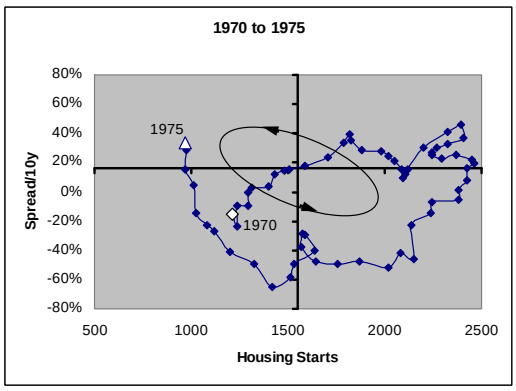
Housing Trough to Housing Trough

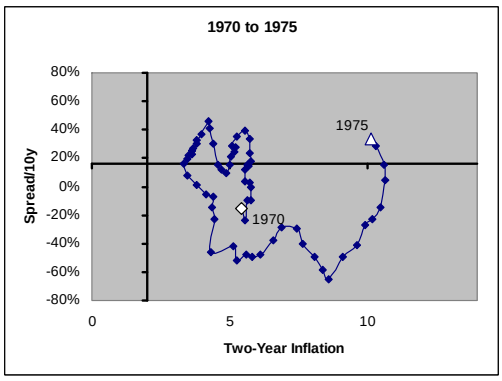


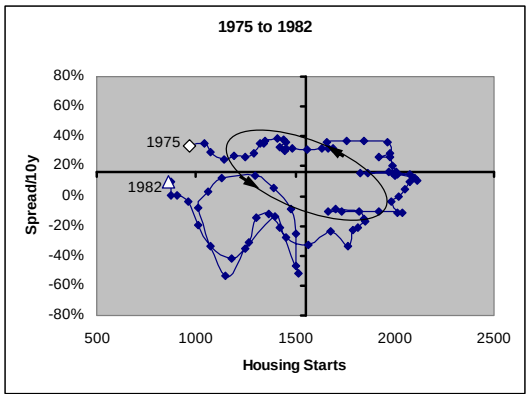








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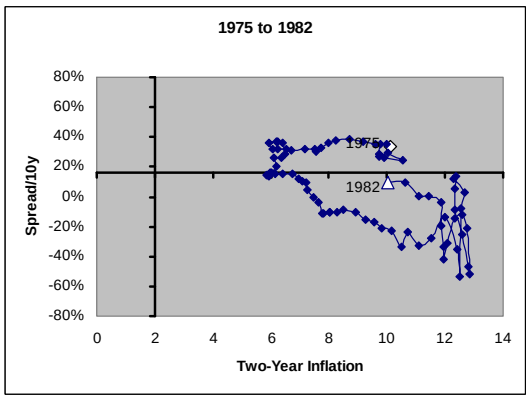
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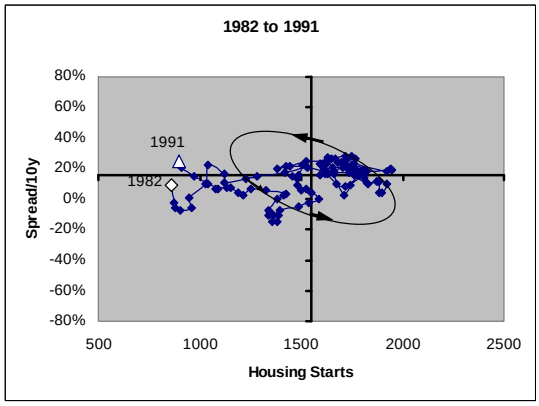
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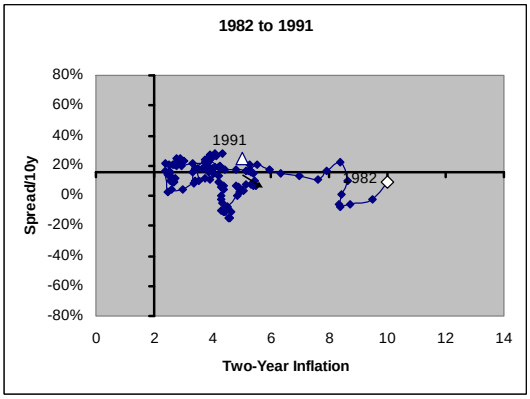
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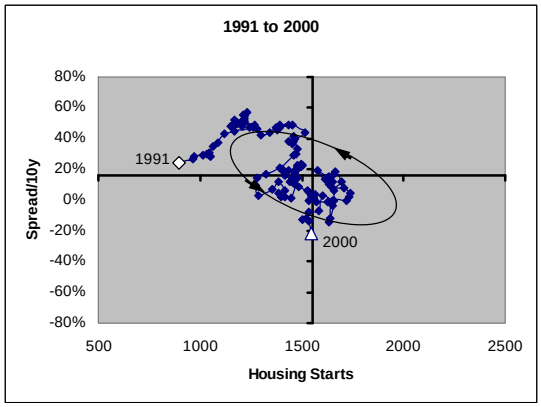
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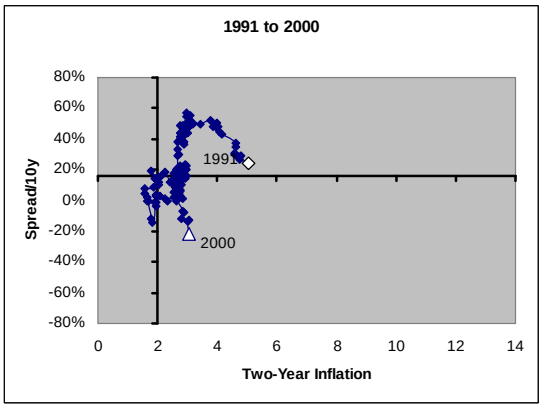
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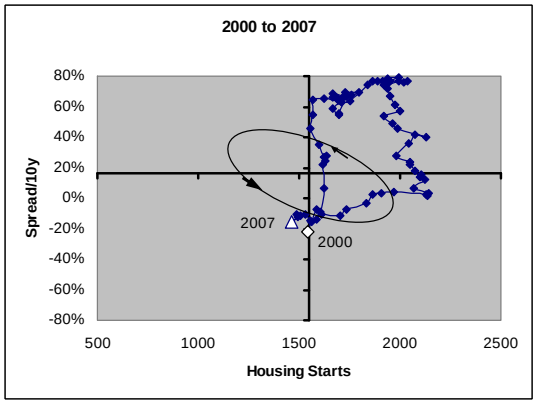
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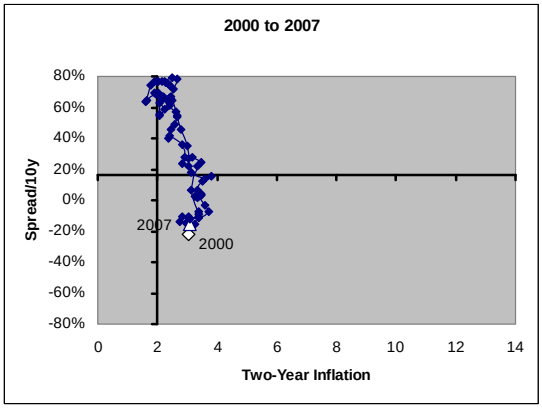
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By the Way

I feel like I am bursting with more to say, but neither space nor time allow it. Briefly, here are a few more points.

The Great Depression: Housing Again!

The housing starts data available from the Census Bureau begin in 1959 and leave us wondering what happened earlier, but in searching for references I ran across the image to the right of the earlier data in Ketchum(1954). Look at that: housing starts declined beginning in 1925! Industrial production didn't begin its nosedive until July 1929 and the Dow Jones Average peaked in October 1929. How weird is that! Problems in housing led the great depression by a full three years. Without doing the hard work to confirm, it seems possible that the increase in the discount rate in 1928 was very hard on an already weakened housing sector, and set in motion the events that led to the Great Depression, dropping housing starts dramatically from over 900 thousand in 1925 to under 100 thousand in 1933. My point here, however, is that we should be looking for the roots of this episode in the operation of the banking system in 1922-1924 which allowed housing starts to peak so high But, of course, I must defer to Bernanke's(2000) *Essays on the Great Depression*, which does not emphasize housing.

FIG. 1.—New nonfarm dwelling units started and real disposable income per capita. (Source: U.S. Department of Labor, U.S. Department of Commerce, National Bureau of Economic Research, and Federal Reserve Bank of Kansas City. See *Monthly Review*, Federal Reserve Bank of Kansas City, March 31, 1953, p. 1.)

Durables and the Wealth Effect

I haven't had the energy or space to comment on the relationship between housing and consumer durables, both of which are very important in US recessions. Is it enough to target housing, or do we need separately to watch consumer durables? A relationship between durables and housing could come from three distinct sources:

- Housing and durables are complementary products (e.g. dishwashers, vacuum cleaners, furniture, etc.).
- Housing wealth helps to finance consumer durables spending.
- The same interest rates or other variables drive both the housing cycle and the durables cycle.

It turns out that much of the amplitude in consumer durables comes from vehicles not furniture. That seems to reduce the importance of complementarity. Though the

housing wealth effect on vehicles is doubtlessly real, it operates with the kind of delay that is unlikely to connect housing wealth with durable spending rapidly enough and intensely enough to explain why spending on consumer durables declines within a quarter of the housing volume decline even though the price adjustment is much delayed. So it's the common driver: interest rates and employment.

International Evidence

In the course of writing this paper I have collected material on a large number of OECD countries. Though the data sets are briefer, it is often the case that problems in residential investment precede spells of rising unemployment in many of these countries, but generally the evidence is not so compelling as it is for the US. Of course, it isn't surprising that many of these smaller countries "import" the business cycle via exchange rate turbulence and/or export weakness, while the US problems are mostly home-grown. For more on this, another time.

I note that there is a large and growing literature on housing and the business cycle internationally, including the widely cited IMF piece, Helbing and Terrones(2003), and several OECD working papers, Van den Noord (2004, 2006) and Hoeller and Rae(2007), and the Fed study Ahearn et.al.(2005). In contrast to the present paper, these studies focus on home prices, not home volumes. In a paper on housing and the business cycle, there are several reasons for an emphasis of volumes. First, without a volume cycle in some component of GDP, there cannot be negative growth of real GDP or rising unemployment and thus no recession. Second, the wealth effects created by the price cycle are not likely to have much to do with the very short-run volume problems we call recessions. For a recession, there needs to be some source of social coordination that gets large numbers of consumers or businesses to cut back spending at about the same time. The negative wealth effect that we are now experiencing from housing is going to affect each of us in different ways at different points in time. That's a recipe for sluggish growth, not a recession.

Conclusion

The pertinent facts: It's a consumer cycle, not a business cycle

Housing makes an incidental contribution to normal economic growth.

> The average growth of GDP since 1947 has been 3.47 percent per year. Only 4.6% of that growth has originated in residential investment (0.16).

Though unimportant in normal periods, weakness in housing is a critical part of US economic recessions.

> Excepting the Department of Defense Downturn in 1953 and the Internet Comeuppance in 2001, problems in residential investment have contributed 26% of the weakness in the economy in the year before the eight recessions since WWII, and 11% of the weakness in the two-year periods commencing with the recessions.

Most of the other leading weakness is also on the consumer side.

> In the years before recessions, 20% of the weakness is from consumer durables, 10% from consumer services and 9% from consumer nondurables. Thus consumers contribute a total of 65% of the leading weakness. In contrast, business spending contributes only 10% of the weakness before recessions; 8% is from equipment and software and 2% from business structures. Most of the weakness on the business side coincides with the recessions rather than leads them.

The first item to soften and the first to turn back up is residential investment.

> The temporal ordering of the spending weakness is: residential investment, consumer durables, consumer nondurables and consumer services before the recession, and then, once the recession officially commences, business spending on the short-lived assets, equipment and software, and, last, business spending on the long-lived assets, offices and factories. The ordering in the recovery is exactly the same.

To summarize: *It's a consumer cycle, not a business cycle.*

Policy Targets

Last, an apology, of sorts. I am suggesting that housing starts should play a prominent role in the conduct of monetary policy but I realize that Section 2A of the Federal Reserve Act stipulates:

> The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.

A shortened version of this task is: "Make us happy." Consistent with that task, here is my personal monetary policy to-do list:

1. Smooth the business cycle.

   Happiness and well-being are much affected by the collective unwanted idleness we call recessions. It would be helpful if our monetary authorities could do something to make recessions less frequent and less severe and more short-lived. Housing surely deserves attention in that enterprise.

2. Keep us working productively

Happiness and well-being can also be affected if our financial markets absorb too much of our productive time and energy, and if savings are diverted into unwise real investments. It would be helpful if our monetary authorities did what they could to limit the speculative bubbles that absorb our labor time and that divert savings into low-yielding investments. Housing surely deserves attention in that enterprise.

3. Limit the redistribution of wealth caused by financial market disruptions.[16]

   The part of your wealth that comes deservedly from hard work and special foresight is not a problem for me, but I am made miserable when my wealth is transferred to you by unstable and uncaring financial markets. It would be helpful if our monetary policy makers could minimize the extent to which turbulence in financial markets causes redistributions of wealth from one group to another, as for example, when unexpected inflation transfers wealth from lenders to borrowers. Since housing price appreciation effects a substantial redistribution of wealth from renters (future owners) to current homeowners, housing surely deserves attention in that enterprise.

4. Keep our balance sheets accurately reflecting reality.

   Happiness and well-being can also be affected if we do not save enough to provide for the material and medical needs of our elderly. The real assets on which our future depends are the factories and equipment and knowledge and homes that are needed to produce the GDP of the future. The numerical valuations of these assets that we record on our hard drives are only a shadow of those real assets, a shadow that is sometimes larger and sometimes smaller than the real thing. For us to do our planning correctly, we need these numbers to reflect reality. We want our measured asset values to increase when our investments and discoveries make us confident that future GDP will be greater than we had originally thought. We do not want a monetary system that allows us to put phantom assets onto our balance sheets and that signals to us that hard work and savings are not needed to prepare for our retirements. Housing surely deserves attention in that enterprise. Of particular concern is the fact that, absent a change in the technology for transforming residential land into housing services, the contribution of our residential land to GDP is about the same now as it was five years ago, but on our hard drives we are recording real values for this land that are double what they were.[17]

[16] Doepke and Schneider (2006) , Bach and Stephenson(1974), Cuikerman, et. al. (1985)

[17] We have been here before. Early in 2001 when newspapers reported "7 Trillion Dollars in Wealth Destroyed" I toured the nation to see the damage. Not in Los Angeles, nor Houston, nor St. Louis nor Chicago nor Boston could I find a single factory, or office building or home in rubble, or a single city block under water. Where was the wealth that was destroyed?

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Appendices

Correction of the Defense Filter

Figure 30, which depicts the kernel regression estimate of the contribution of defense, demonstrates that this method doesn't work perfectly, since it assigns relatively high normal defense contributions in the 1947 to 1951 period because of the heavy defense spending in the Korean War commencing in 1951. A corrected normal contribution of defense spending is illustrated in Figure 31 where I have taken the liberty of giving the kernel estimates from 1947 to 1958 a hair cut, thus allowing the defense contributions from 1947 to 1951 to be "normal" on average, not below normal per the kernel estimate in Figure 30.

Figure 30 **Kernel Estimate of Normal Contribution of Defense**

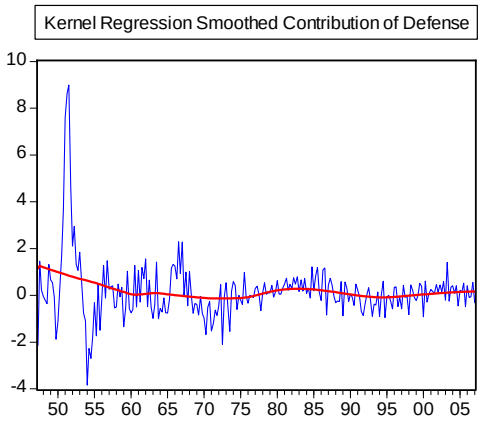
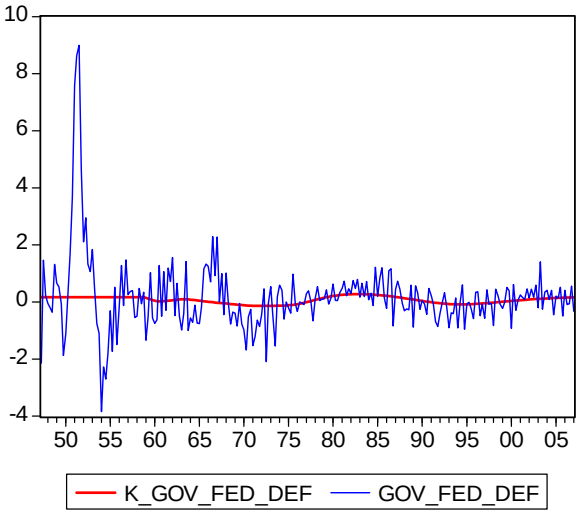


Figure 31 **Corrected Normal Defense Contribution**



Probit models for Predicting Rising Unemployment

Though the variability in GDP growth is dominated by the recession negatives and the above-normal recoveries, the multivariate predictor of GDP growth reported in Table 4 may be picking up something other than the recessions. Just to make sure we identifying recession predictors, Table 7 reports probit models for predicting periods of sharply rising unemployment d(U)>0.4, each using a different component of GDP. This separation of periods by the change in the unemployment rate accurately identifies the official NBER recessions, but without the arbitrariness of the decisions of a committee.

The probit models reported in Table 7 include the lagged change in unemployment, and three variables representing changes in the indicated cumulative: the change over the previous quarter, the previous year and the year before that. These results are sorted by the log likelihood function (or the McFadden R-sq). The log likelihood is exponentiated to find the likelihood ratio expressed relative to the best model.

The probit estimates reported in Table 7 reconfirm what we have already learned from the graphs: the best predictor of recessions is weakness in housing. The second best model uses nondurables but has a likelihood ratio that is only 18% of the residential investment model.

Table 7 Probit Probabilities of Sharply Rising Unemployment

Dependent Variable: D(U)>.4

Method: ML - Binary Probit (Quadratic hill climbing)

Sample (adjusted): 1949Q3 2007Q1

Included observations: 231 after adjustments

Explanatory Variables; Change in Unemployment and Changes in Cumulative Abnormal Contributions

Coefficient			Changes in Cumulative Contr.					
	C	D(U(-1))	Previous Quarter	Previous Year	Two Years Before	Log likelihood	Likelihood Ratio	McFadden R-sq
Residences	-1.84	2.19	-1.34	-0.41	-0.24	-44.92	1	0.461
Nondurables	-1.77	2.18	-1.02	-0.68	0.05	-46.61	0.18	0.441
Services	-1.78	2.22	-1.46	-0.71	0.11	-46.69	0.17	0.440
Exports	-1.83	2.75	-1.17	0.32	0.54	-46.80	0.15	0.438
Structures	-1.79	2.83	-1.07	1.33	0.71	-46.88	0.14	0.437
State and Local	-1.73	2.66	2.44	-1.23	-1.06	-46.92	0.14	0.437
Fed Nondef	-1.75	2.93	-1.25	-1.14	-0.20	-47.85	0.05	0.426
Inventories	-1.69	3.03	-0.13	0.22	-0.07	-48.43	0.03	0.419
Equipment	-1.69	2.89	-0.47	0.39	0.08	-49.06	0.02	0.411
Imports	-1.69	2.66	0.67	-0.23	0.11	-49.06	0.02	0.411
Durables	-1.69	2.50	-0.22	-0.12	-0.07	-49.43	0.01	0.407
Fed Def	-1.67	2.66	-0.48	0.06	-0.02	-49.58	0.01	0.405
z-Statistic								
Residences	-8.9	**4.7**	**-1.8**	**-1.2**	**-1.0**			
Nondurables	-9.1	**4.4**	**-1.2**	**-1.3**	0.2			
Services	-9.0	**4.8**	**-1.2**	**-1.1**	0.2			
Exports	-8.7	**6.1**	**-1.5**	1.0	**1.9**			
Structures	-9.1	**6.0**	-0.6	**1.9**	**1.2**			
State and Local	-9.5	**6.1**	**1.3**	**-1.4**	**-1.5**			
Fed Nondef	-9.1	**6.4**	-1.0	**-1.4**	-0.3			
Inventories	-9.5	**5.8**	-0.5	**1.0**	-0.4			
Equipment	-9.6	**5.0**	-0.5	**1.1**	0.3			
Imports	-9.6	**5.7**	1.0	-0.7	0.5			
Durables	-9.5	**5.4**	-0.4	-0.4	-0.3			
Fed Def	-9.6	**6.4**	-0.5	0.2	-0.1			

Case-Shiller Regression

Table 8 OFHEO regression: Log Price Change Versus Ownership Period

Dependent Variable: PDIFF
Method: Least Squares
Date: 06/20/07 Time: 09:27
Sample: 1 224341 IF HOLD_YRS>1
Included observations: 201137

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D1988Q2	0.066020	0.006051	10.91014	0.0000
D1988Q3	0.070990	0.005177	13.71372	0.0000
D1988Q4	0.048380	0.005213	9.280929	0.0000
D1989Q1	0.043787	0.005711	7.666645	0.0000
D1989Q2	0.059288	0.005763	10.28792	0.0000
D1989Q3	0.043172	0.005582	7.734041	0.0000
D1989Q4	0.038916	0.005805	6.703564	0.0000
D1990Q1	0.009046	0.006400	1.413444	0.1575
D1990Q2	0.007867	0.006491	1.211991	0.2255
D1990Q3	-0.018630	0.006276	-2.968307	0.0030
D1990Q4	-0.007740	0.006767	-1.143799	0.2527
D1991Q1	-0.024716	0.007505	-3.293486	0.0010
D1991Q2	-0.004386	0.006911	-0.634691	0.5256
D1991Q3	0.030517	0.006053	5.041431	0.0000
D1991Q4	-0.014710	0.006804	-2.162115	0.0306
D1992Q1	-0.033838	0.007586	-4.460525	0.0000
D1992Q2	-0.020328	0.007410	-2.743408	0.0061
D1992Q3	-0.004008	0.007015	-0.571368	0.5678
D1992Q4	-0.035429	0.007079	-5.004871	0.0000
D1993Q1	-0.029547	0.007458	-3.961906	0.0001
D1993Q2	-0.007814	0.007371	-1.060189	0.2891
D1993Q3	-0.029277	0.006881	-4.254687	0.0000
D1993Q4	-0.021902	0.006734	-3.252590	0.0011
D1994Q1	-0.032868	0.006701	-4.905263	0.0000
D1994Q2	-0.004142	0.006365	-0.650781	0.5152
D1994Q3	0.003950	0.006068	0.650956	0.5151
D1994Q4	-0.021197	0.006368	-3.328629	0.0009
D1995Q1	-0.016187	0.006803	-2.379271	0.0173
D1995Q2	0.007829	0.006690	1.170275	0.2419
D1995Q3	0.021245	0.006392	3.323830	0.0009
D1995Q4	0.004297	0.006790	0.632794	0.5269
D1996Q1	0.002763	0.007142	0.386820	0.6989
D1996Q2	-0.009904	0.006662	-1.486729	0.1371
D1996Q3	0.017758	0.006217	2.856324	0.0043
D1996Q4	-0.012454	0.006470	-1.924700	0.0543

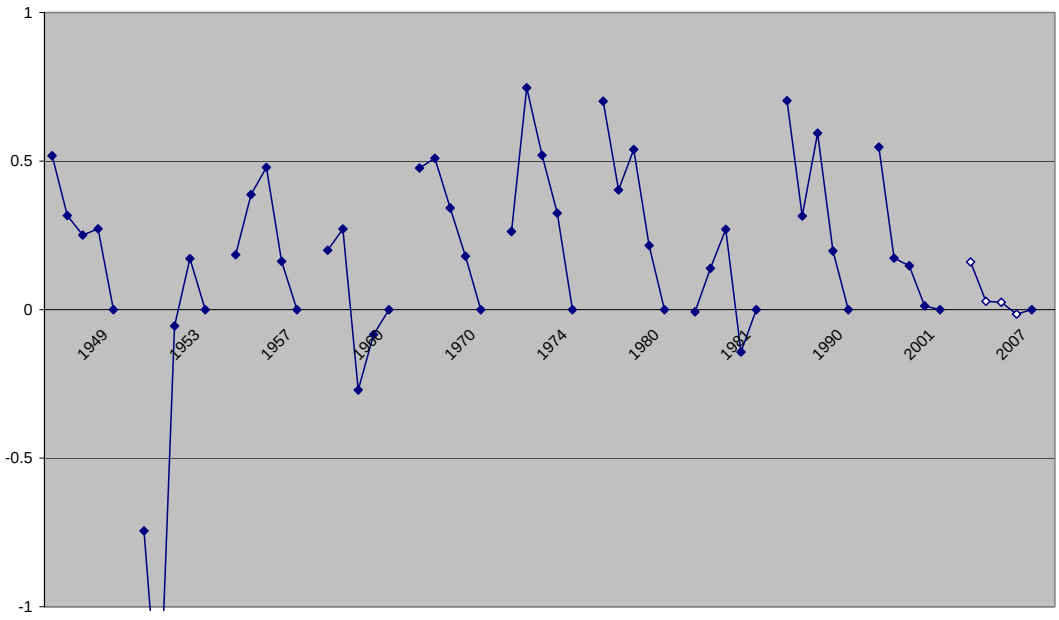
D1997Q1	0.002793	0.006730	0.415050	0.6781
D1997Q2	0.023378	0.006418	3.642355	0.0003
D1997Q3	0.012183	0.005736	2.124172	0.0337
D1997Q4	0.016513	0.005657	2.919358	0.0035
D1998Q1	0.020697	0.005938	3.485320	0.0005
D1998Q2	0.023278	0.005639	4.127951	0.0000
D1998Q3	0.032363	0.005023	6.443042	0.0000
D1998Q4	0.005682	0.005236	1.085033	0.2779
D1999Q1	-0.018335	0.005545	-3.306436	0.0009
D1999Q2	0.048396	0.005241	9.233327	0.0000
D1999Q3	0.018293	0.004763	3.840826	0.0001
D1999Q4	0.006287	0.005000	1.257414	0.2086
D2000Q1	0.025394	0.005441	4.666890	0.0000
D2000Q2	0.045893	0.005237	8.763537	0.0000
D2000Q3	0.020462	0.004974	4.114015	0.0000
D2000Q4	0.011245	0.005242	2.145163	0.0319
D2001Q1	0.028081	0.005627	4.989984	0.0000
D2001Q2	0.042063	0.005440	7.731791	0.0000
D2001Q3	0.026675	0.004927	5.414237	0.0000
D2001Q4	0.008181	0.005206	1.571401	0.1161
D2002Q1	0.029143	0.005417	5.379572	0.0000
D2002Q2	0.057934	0.005041	11.49168	0.0000
D2002Q3	0.056197	0.004912	11.44039	0.0000
D2002Q4	0.030347	0.005188	5.849718	0.0000
D2003Q1	0.029062	0.005762	5.043565	0.0000
D2003Q2	0.056362	0.005814	9.694550	0.0000
D2003Q3	0.062411	0.005166	12.08130	0.0000
D2003Q4	0.044989	0.005173	8.696708	0.0000
D2004Q1	0.069541	0.005734	12.12759	0.0000
D2004Q2	0.095950	0.005759	16.65989	0.0000
D2004Q3	0.051858	0.005546	9.350439	0.0000
D2004Q4	0.019341	0.005825	3.320530	0.0009
D2005Q1	0.049117	0.006312	7.781425	0.0000
D2005Q2	0.074783	0.006215	12.03184	0.0000
D2005Q3	0.051610	0.005784	8.923036	0.0000
D2005Q4	0.040728	0.006082	6.696331	0.0000
D2006Q1	-8.01E-05	0.006834	-0.011714	0.9907
D2006Q2	0.018334	0.007922	2.314276	0.0207

R-squared	0.539296	Mean dependent var	0.320433
Adjusted R-squared	0.539131	S.D. dependent var	0.453066
S.E. of regression	0.307574	Akaike info criterion	0.480162
Sum squared resid	19021.04	Schwarz criterion	0.483869
Log likelihood	-48216.21	Durbin-Watson stat	1.986498

Figures: Details of Contributions in All Ten Recessions

Figure 32 Weakness or Strength of Consumer Durables Before and During Recessions

Consumer Durables
Cumulative "Abnormal" Contribution Before Recessions



Consumer Durables
Cumulative "Abnormal" Contribution During Recessions

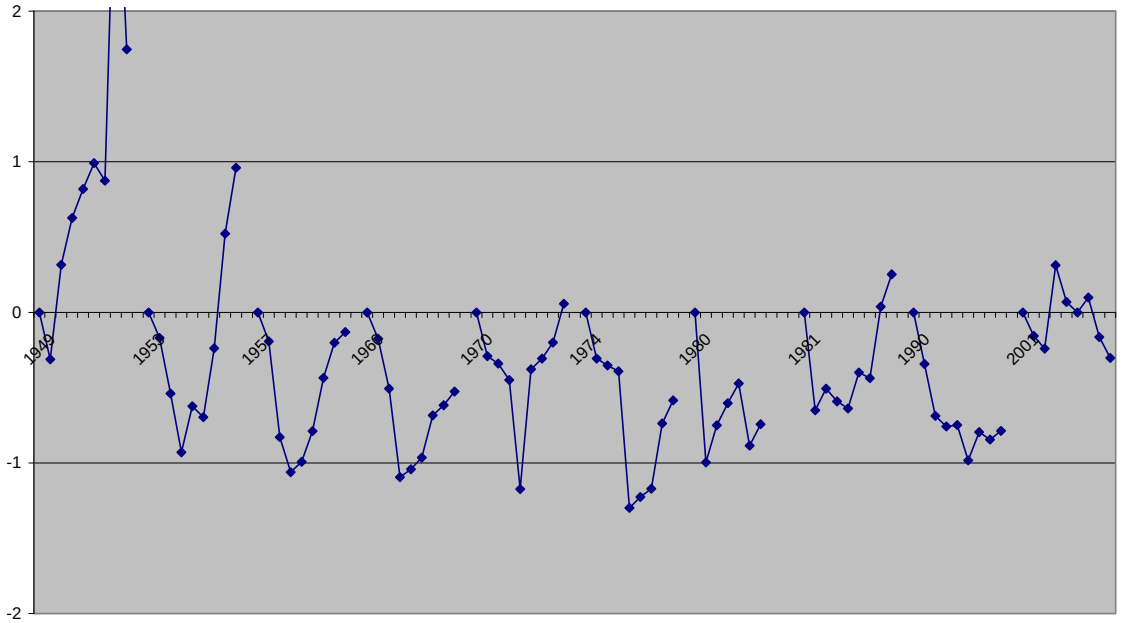
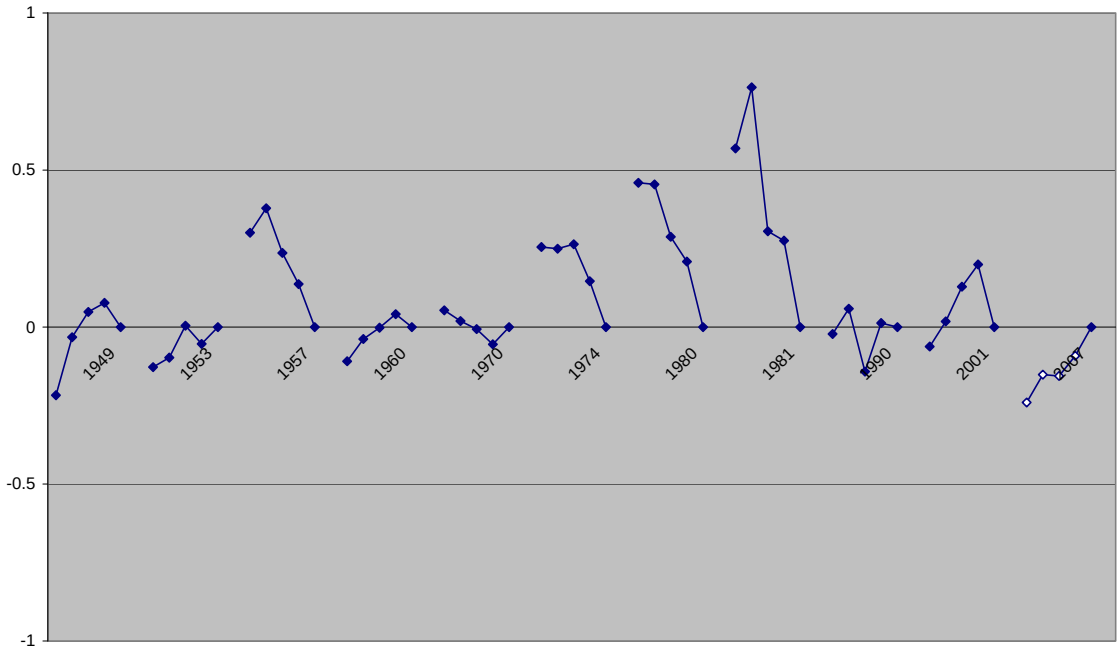


Figure 33 **Weakness or Strength of Consumer Services Before and During Recessions**

Consumer Services
Cumulative "Abnormal" Contribution Before Recessions



Consumer Services
Cumulative "Abnormal" Contribution During Recessions

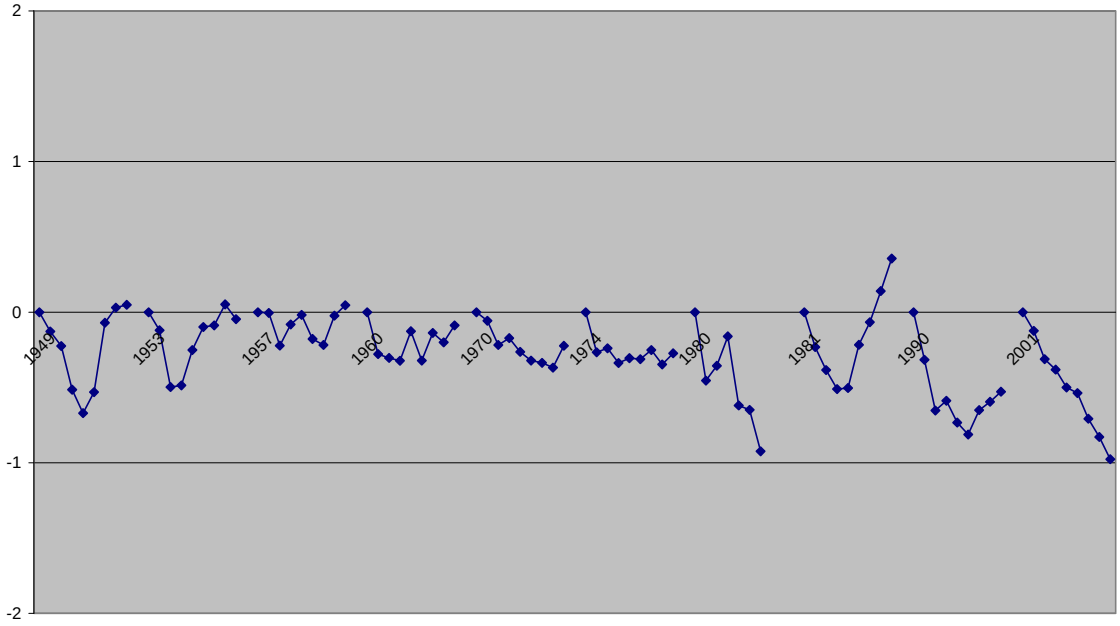
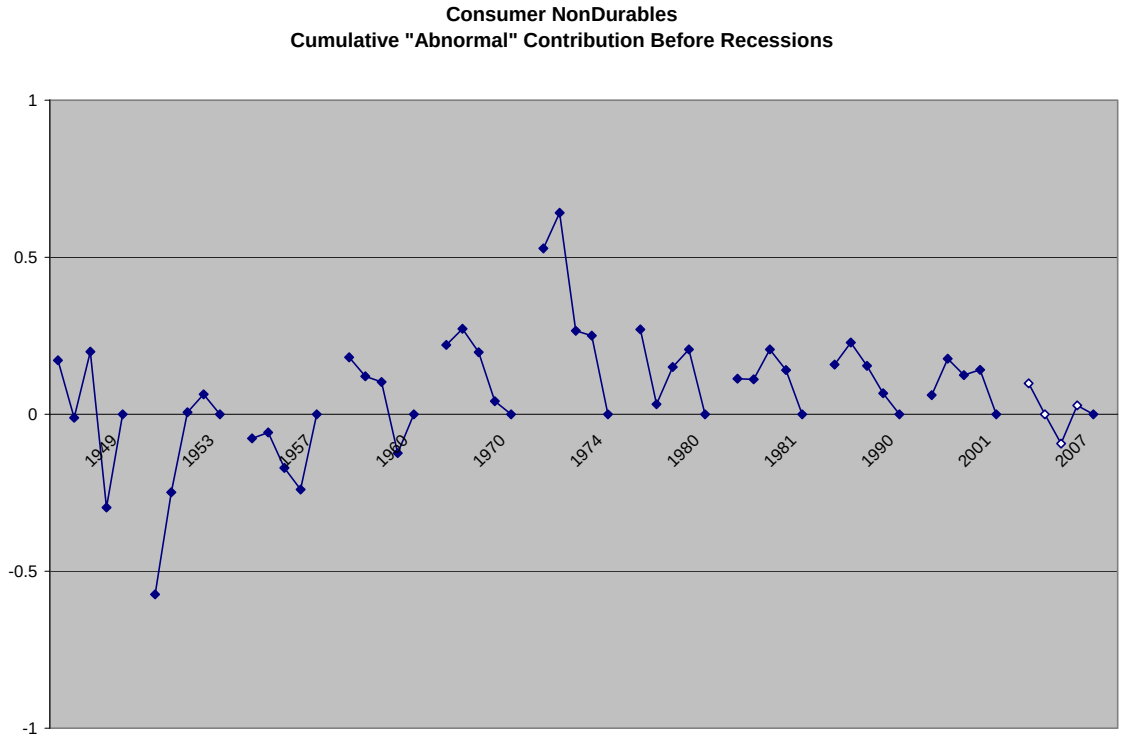


Figure 34 Weakness or Strength of Consumer Nondurables Before and During Recessions



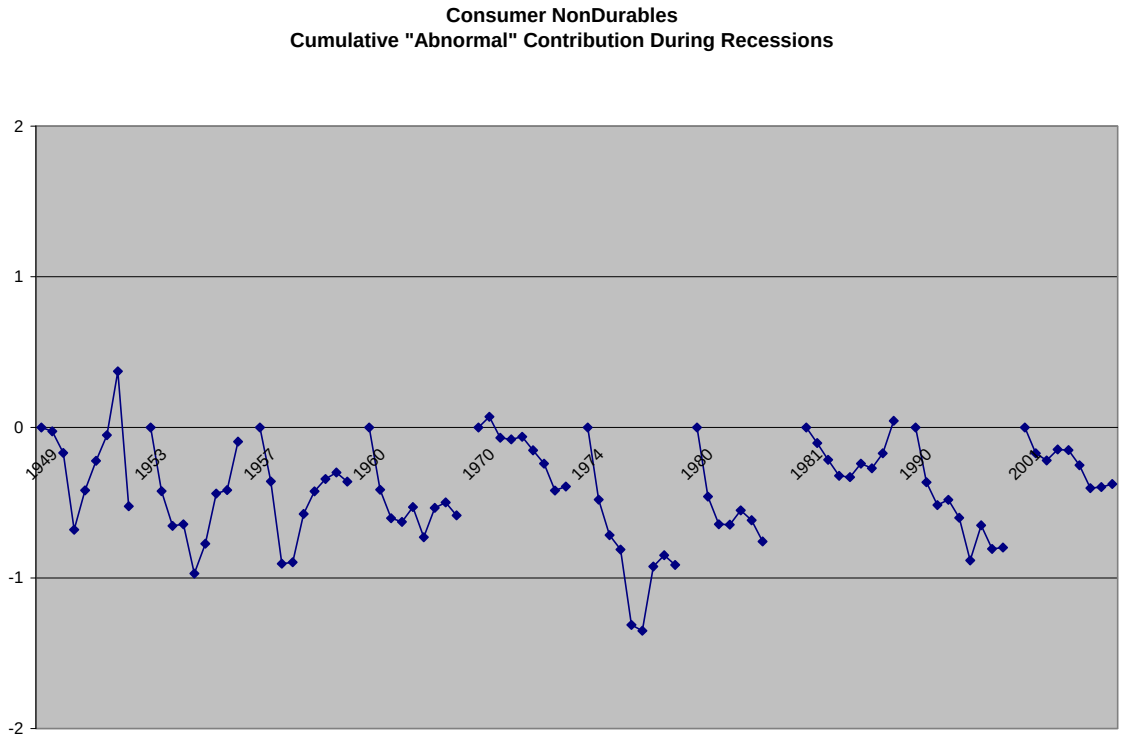
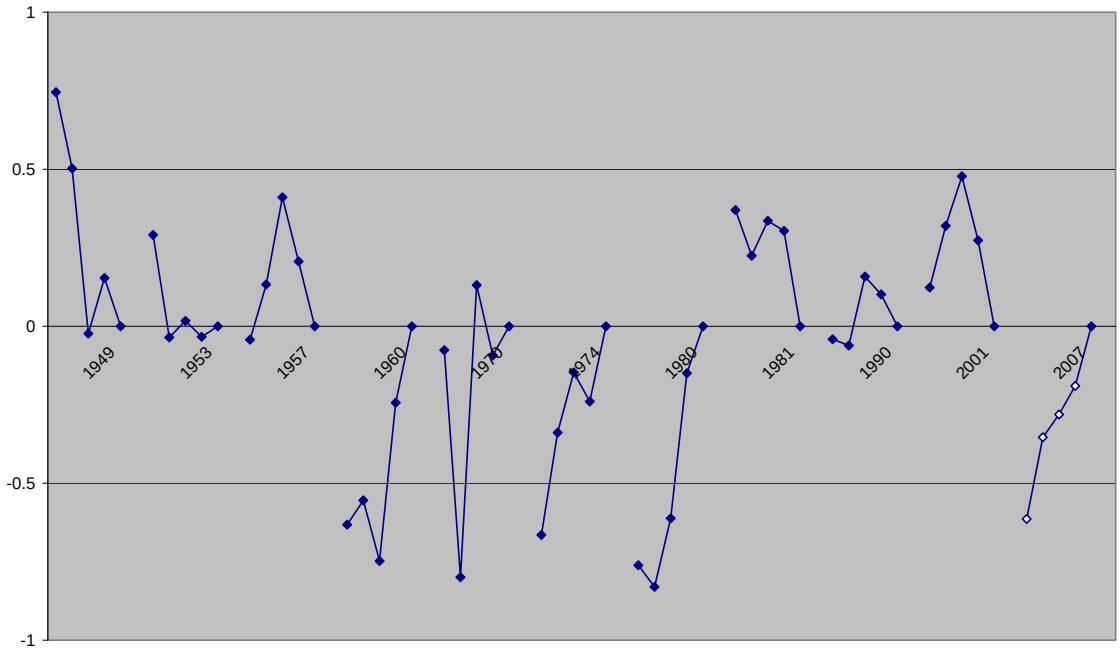


Figure 35 **Weakness or Strength of Exports Before and During Recessions**

Exports
Cumulative "Abnormal" Contribution Before Recessions



Exports
Cumulative "Abnormal" Contribution During Recessions

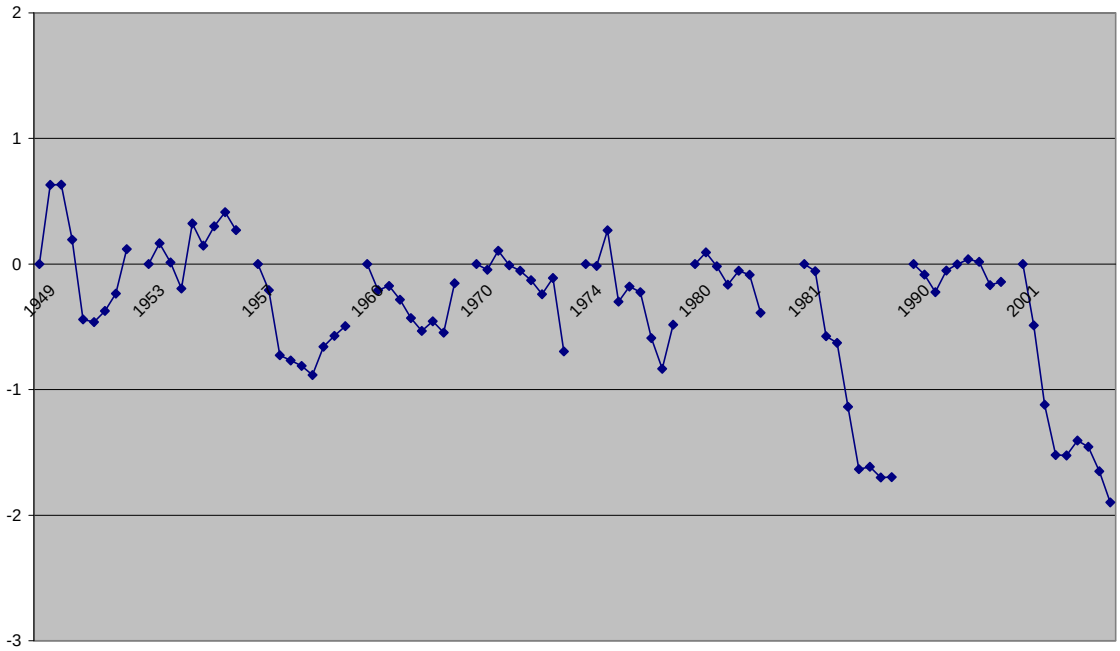
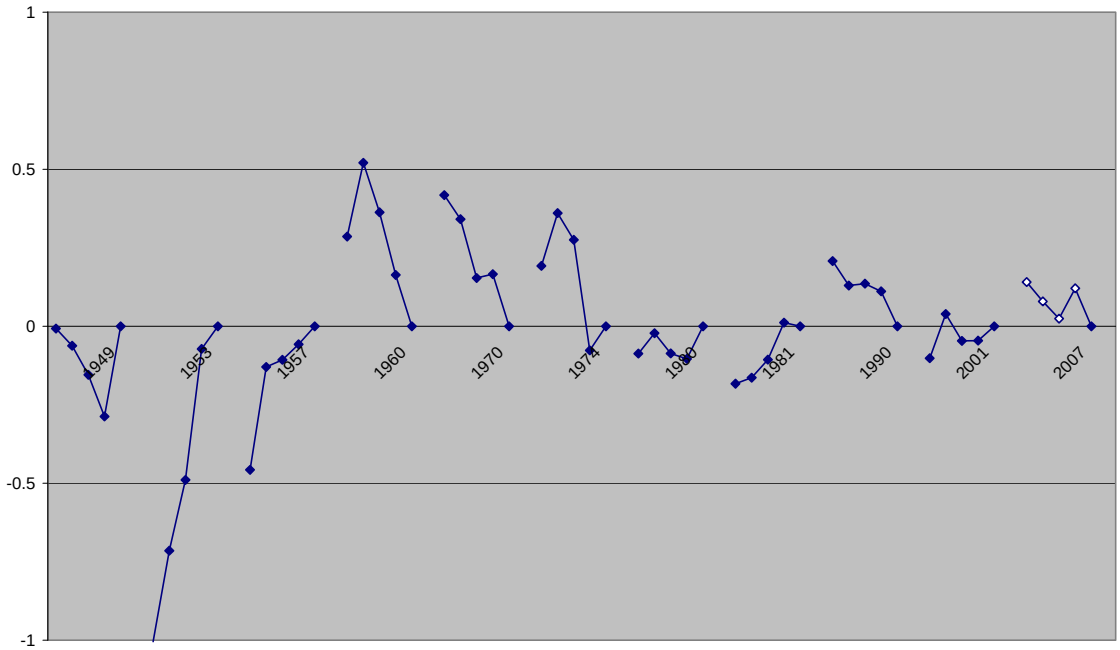


Figure 36 **Weakness or Strength of Defense Spending Before and During Recessions**

Federal Defense Spending
Cumulative "Abnormal" Contribution Before Recessions



Federal Defense
Cumulative "Abnormal" Contribution During Recessions

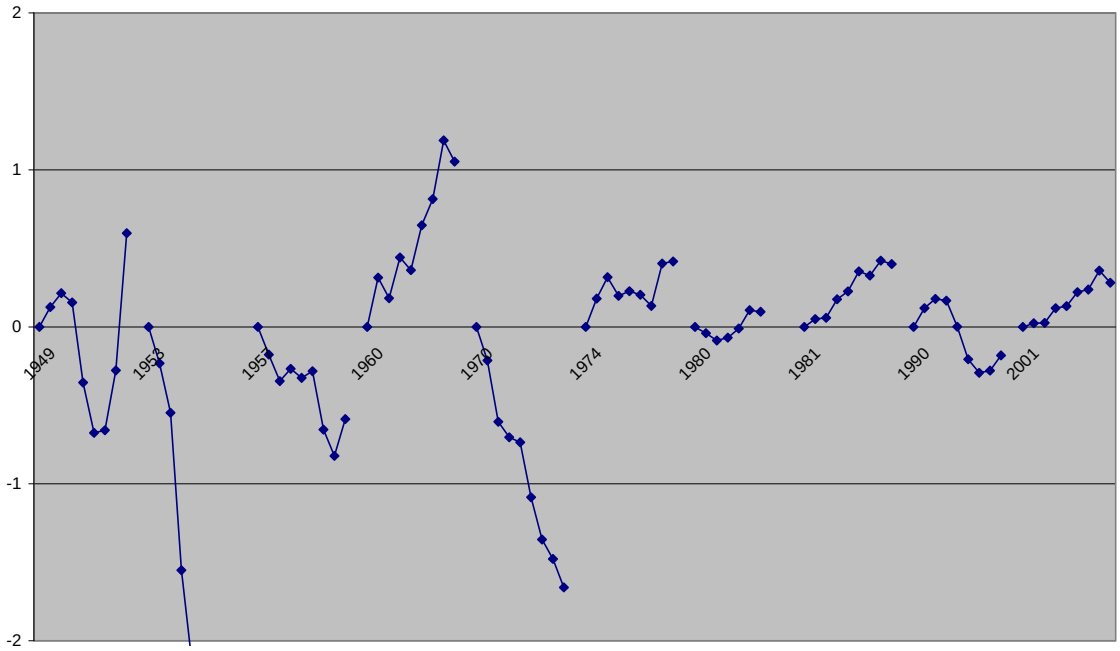
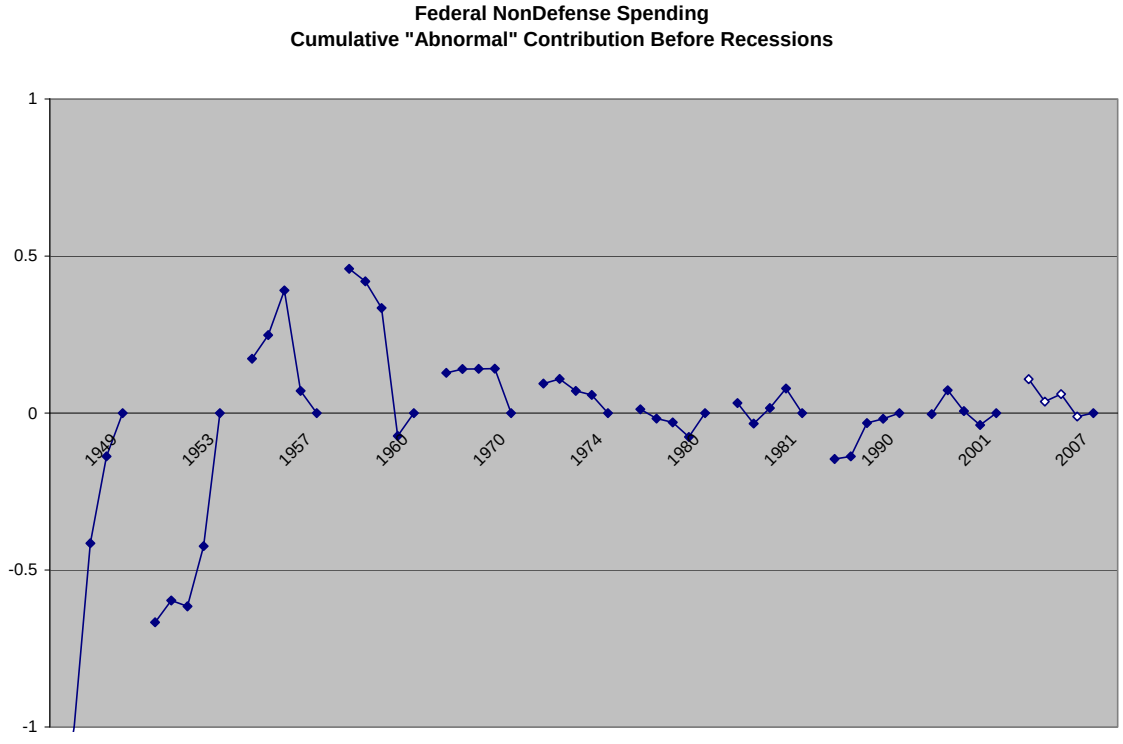


Figure 37 Weakness or Strength of Federal Non-defense Before and During Recessions



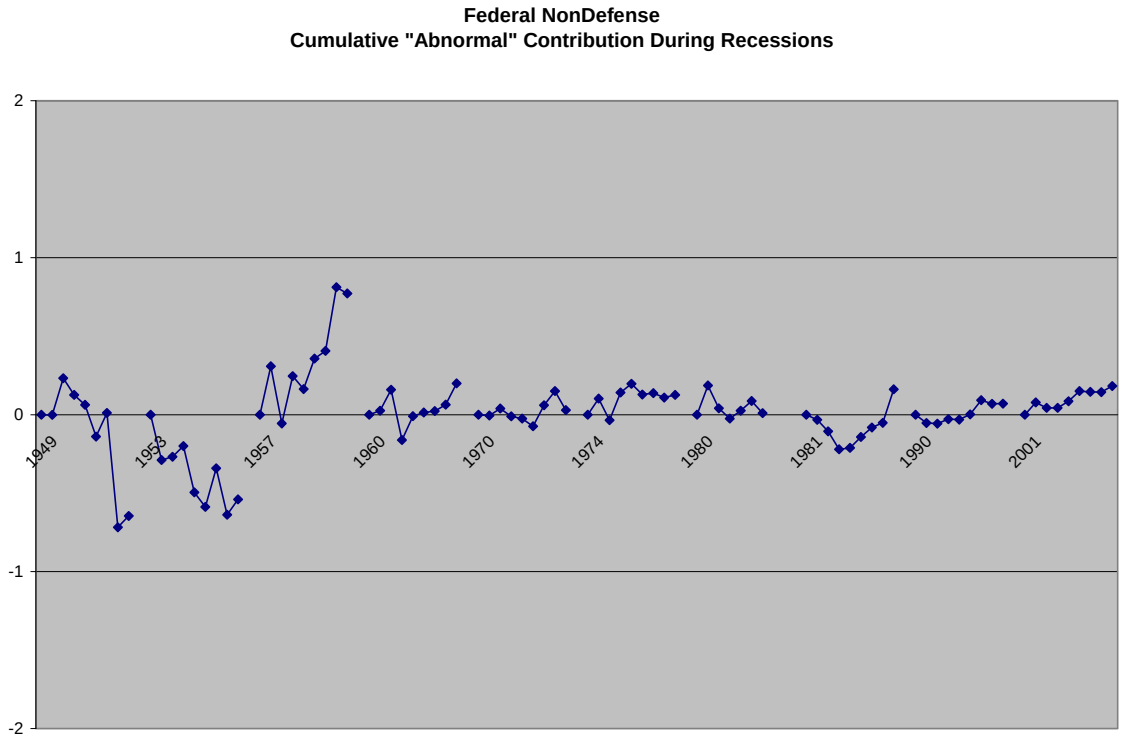
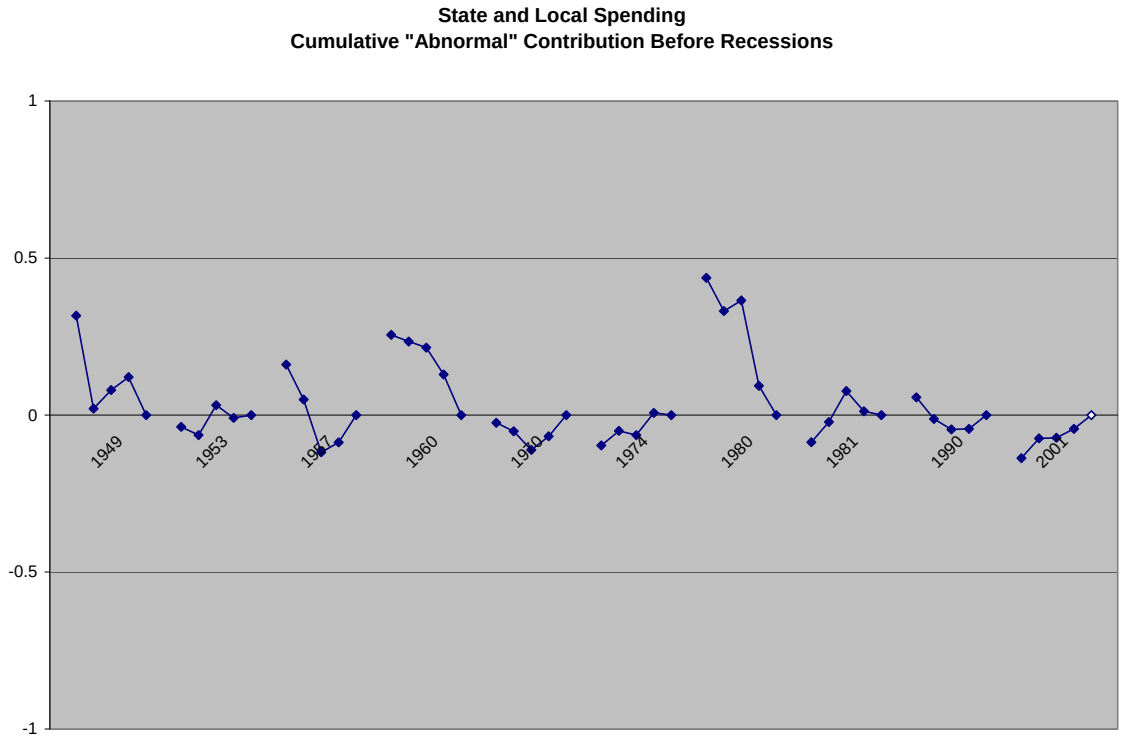


Figure 38 Weakness or Strength of State and Local Gov Before and During Recessions



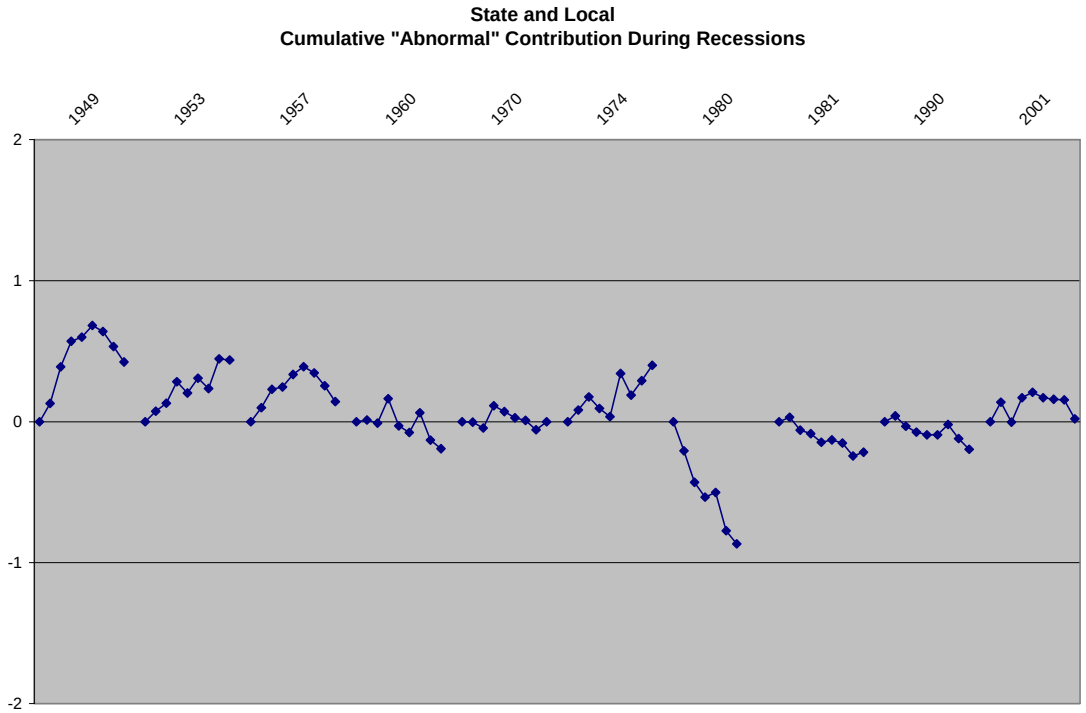
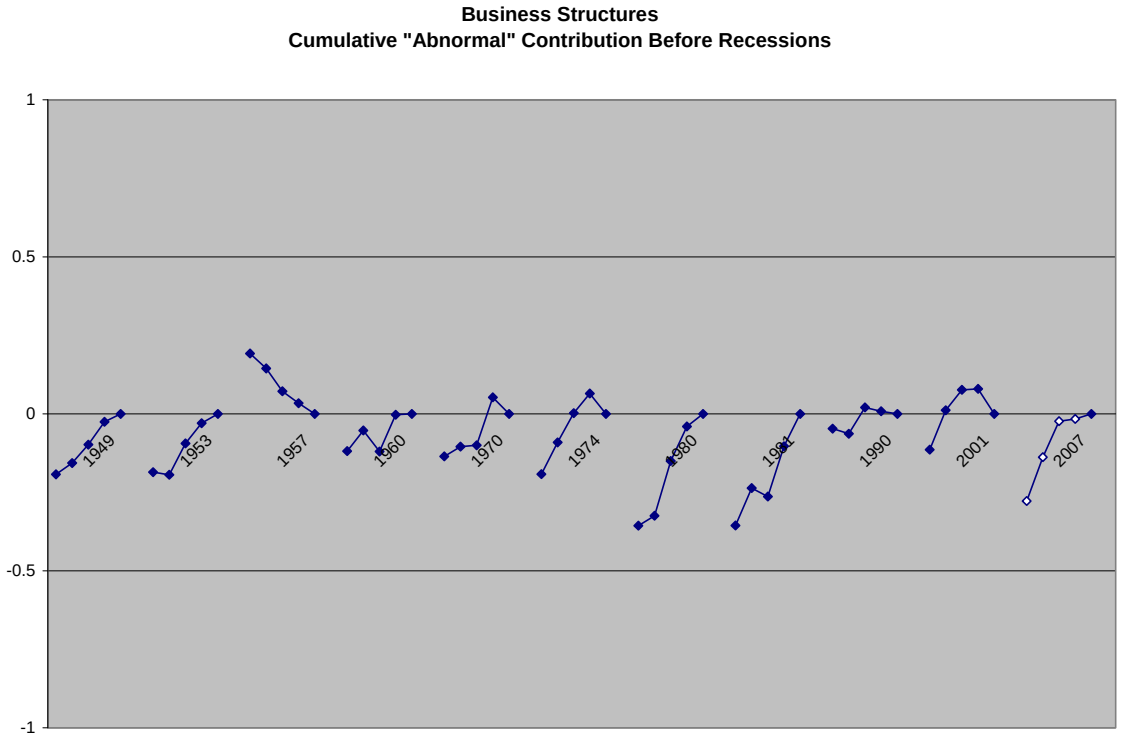


Figure 39 Weakness or Strength of Business Structures Before and During Recessions



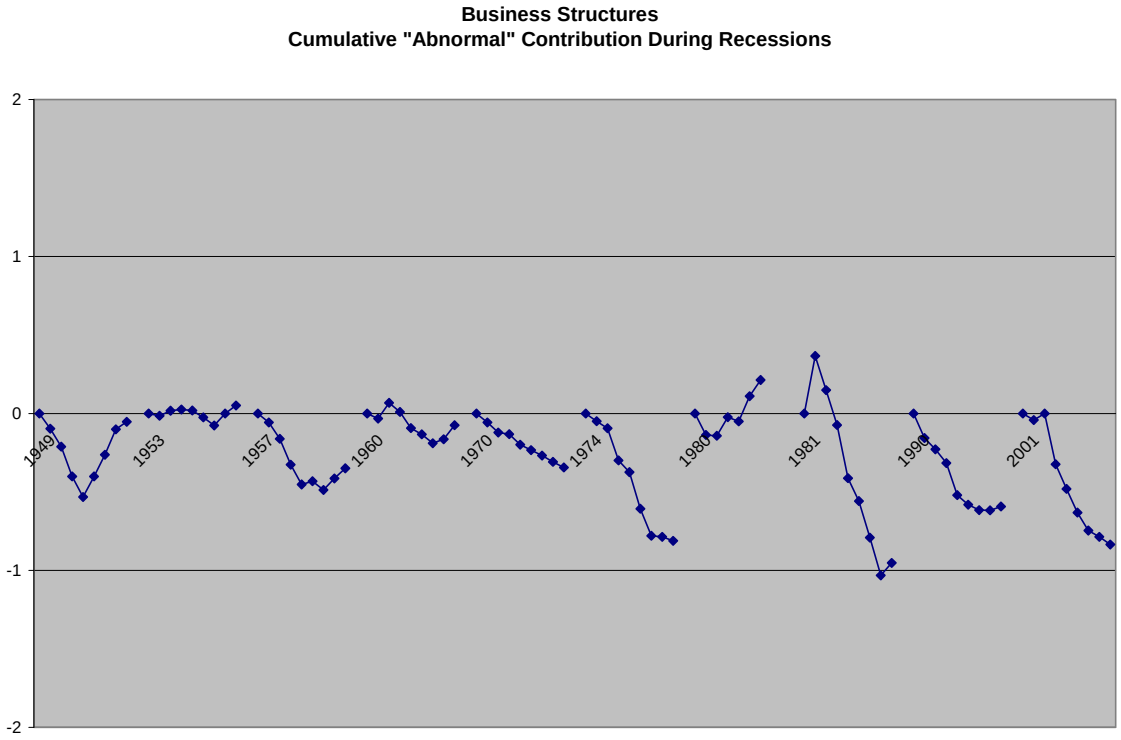
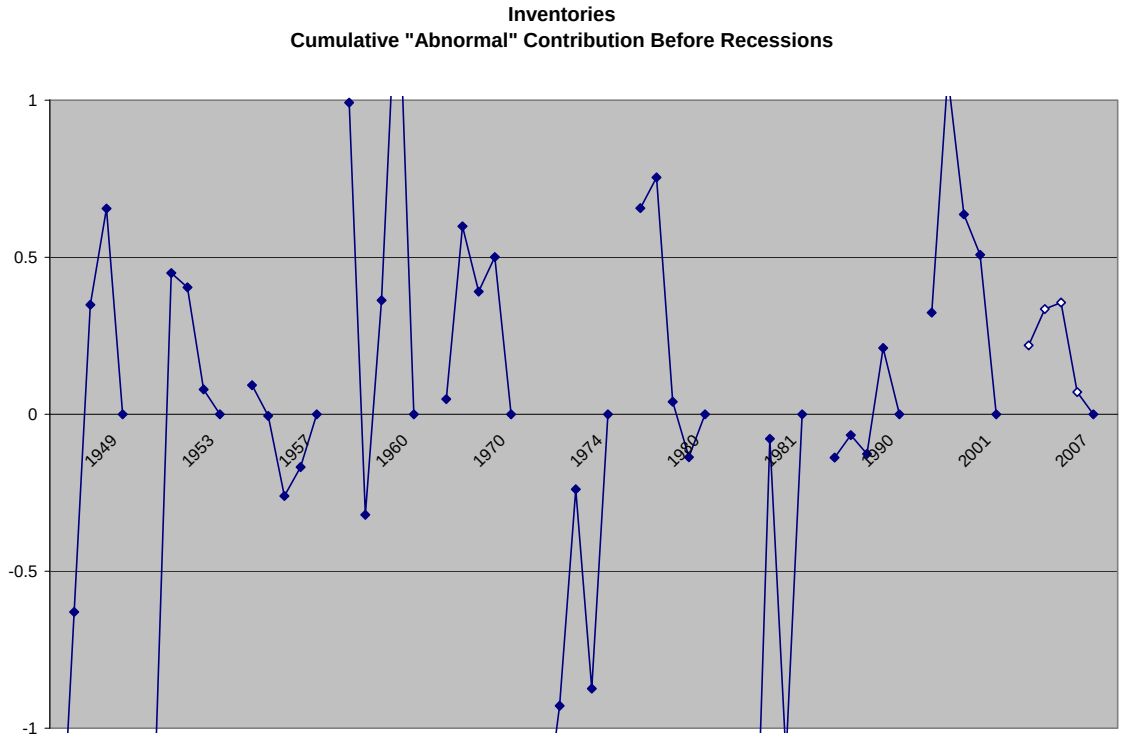


Figure 40 Weakness or Strength of Inventories Before and During Recessions



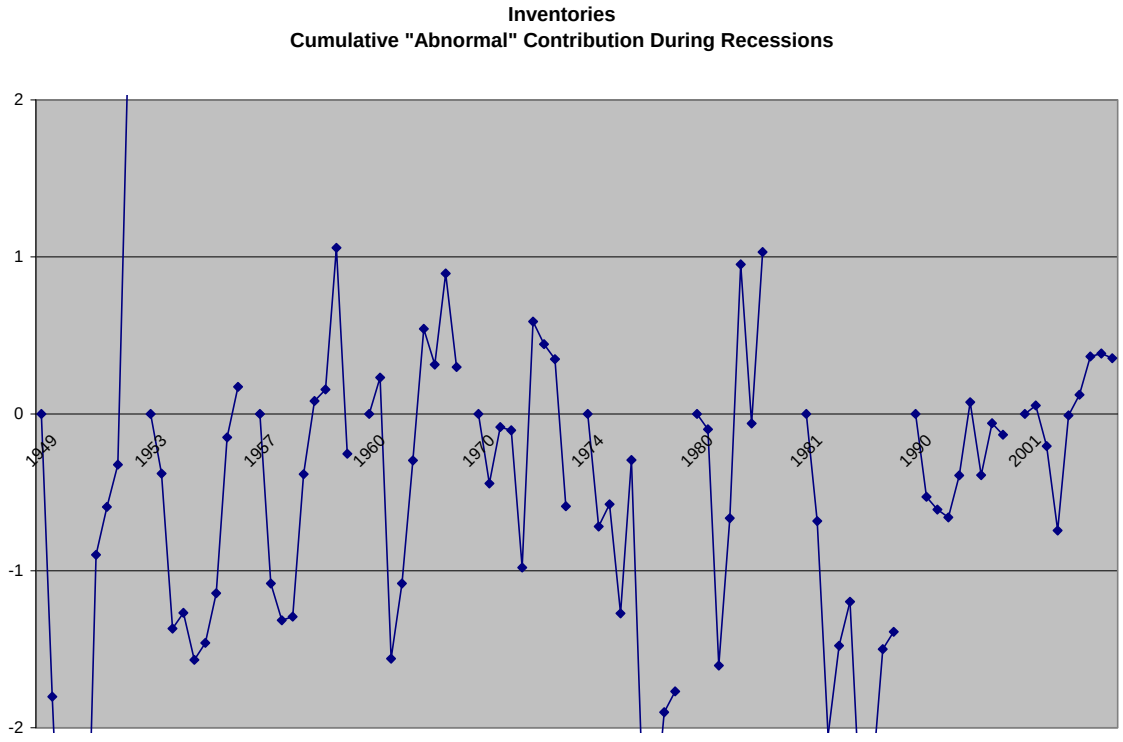


Figure 41 Weakness or Strength of Imports Before and During Recessions