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Understanding Remodeling Cycles

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Abstract

This paper assesses the cyclical nature of the remodeling industry between 1987 and 2007, and how remodeling cycles relate to cycles in the homebuilding industry and the broader economy. This research finds that remodeling activity is pro-cyclical with both new residential construction and the broader economy, but remodeling seems to lag homebuilding by several quarters. Also, while remodeling activity is highly cyclical and volatile, it is still less volatile than the homebuilding industry. The high cyclicality of remodeling activity appears to be driven by upper-end discretionary improvements, which are quite volatile, whereas the more routine and less costly projects, such as systems and equipment upgrades and maintenance and repairs, are much more stable over time. Lastly, since a much greater share of D-I-Y spending goes toward these highly cyclical discretionary projects, D-I-Y spending fluctuates considerably more as compared to professional spending.

I. Introduction

Residential construction is an unusually cyclical industry relative to other major sectors of the economy, with frequently alternating periods of significant growth and decline in the industry.[1] Certainly, much of the volatility in the overall economy, or the general business cycle, can be attributed to the large swings in homebuilding activity. While a great deal of research has been conducted over the years on the causes and consequences of homebuilding cycles, very little work carefully examines cycles in the remodeling industry due to considerable limitations in the availability and reliability of data. Much like the homebuilding industry, the remodeling industry also experiences periods of significant upturn and downturn. There are important implications of the severe cyclicality in the homebuilding and remodeling industries due to the size and structure of these industries. For example, recent research from the Joint Center for Housing Studies found that the home improvement industry remains extremely fragmented with many small contractors that are highly susceptible to failure.[2] Thus, each new cycle of remodeling activity will likely contribute to considerable churn in the industry.

The first objective of this study is to simply gain a better understanding of the cyclical relationships among the remodeling industry, new residential construction and the broader economy. Some of the basic questions this study aims to address include: How does remodeling activity react to changes in the economy? What common factors drive cycles in remodeling and in homebuilding? By how much time, if any, do homebuilding cycles tend to lead or lag remodeling cycles? The second objective of this study is to deconstruct remodeling spending into its various components, such as improvement vs. maintenance spending, professional vs. do-it-yourself, and spending by the various project types, so as to better understand which segments of the remodeling market might be more or less affected by the cycle. This deconstruction of remodeling spending helps to identify the underlying drivers of remodeling cyclicality.

This study is organized in the following manner: Section II reviews the literature on the evidence and theories of homebuilding cycles, and the implications for remodeling, including why certain types of home improvement and repair spending are expected to gain or lose market share at certain points in the cycle. Section III explains the methodology behind the selected definition of cyclical activity in remodeling. Section IV presents a detailed assessment of the co-

[1] See Appendix Figure A-1.
[2] See Will and Baker (2007).

movement, magnitude, volatility, and duration of remodeling, homebuilding and GDP cycles in recent years. Section V provides analysis of the decomposition of remodeling activity in order to understand the underlying cyclicality of remodeling. Lastly, section VI concludes that like new construction, remodeling is a very cyclical industry that tends to move in line with changes in the broader economy. While new construction cycles typically are more pronounced than home improvement and repair cycles—generally reaching higher rates of growth and steeper rates of decline—the industries were closely aligned and usually moved together during the period of observation. On the whole, homebuilding cycles did not seem to have much of a lead over remodeling cycles over the past twenty years, yet during the most recent cycle homebuilding led remodeling activity by a full six months. As expected, improvement spending—particularly high-end discretionary spending— appears to be more volatile and sensitive to changes in the cycle than more routine and less costly maintenance and repairs.

II. Theories and Evidence of Housing and Business Cycles

The housing industry is a major component of the U.S. economy, with residential fixed investment totaling $641 billion in 2007.[3] Investment in new construction and improvements to the housing stock has comprised 30 percent of total private domestic investment on average since 1950, and has made up about 5 percent of GDP. Historically, the residential construction industry has experienced frequent booms and busts. The size of the housing industry and its impact on the general economy has generated much interest in studying the possible reasons behind the strong cyclicality in new home construction.[4]

The various explanations over the years for cyclical fluctuations in the housing market have been somewhat conflicting. The earlier literature offered a variety of suggestions for the main causes of housing production cycles, including cyclical movements in the capital market and in mortgage lending, changes in income—which are tied to the business cycle and affects housing demand and demand for mortgage funds—and government influence through monetary and tax policy, as well as direct subsidization of housing costs and financing (Alberts 1962, Brady 1967, Grebler and Burns 1982, Maisel 1963, Smith et al. 1988). Later studies focused on lags in build time and builders' expectations of future house prices leading to overbuilding, and thus a mismatch between housing supply and demand (Chinloy 1996, Lee 1999). Lee reasons that "an optimizing firm would invest to build in spite of unfavorable current economic conditions in order not to miss the forthcoming improved market condition and benefit from it" (p. 1225). While many factors likely contribute to housing cycles, it is well documented in the housing cycles literature that residential construction is pro-cyclical with the broader business cycle, meaning that housing and GDP both tend to expand and contract during the same time periods. In particular, it appears that housing "leads" the business cycle in that the housing market will contract some time before the general economy begins to slow down, and housing

[3] Residential fixed investment is defined by the Bureau of Economic Analysis as "investment in residential structures consisting of new construction of permanent-site single-family and multi-family units, improvements (additions, alterations, and major structural replacements) to housing units, expenditures on manufactured homes, brokers' commissions on the sale of residential property, and net purchases of used structures from government agencies. Residential structures also include some types of equipment that are built into residential structures, such as heating and air-conditioning equipment." See http://www.bea.gov/glossary/glossary.cfm.

[4] In addition to the literature on the cyclicality of housing production, there also exists an extensive literature on the causes and consequences of house price cycles over time. See, for example, Catte et al. (2004), Cunningham and Kolet (2007), Glaeser et al. (2005), Glaeser and Gyourko (2007), Iacoviello (2005), Malpezzi and Wachter (2005), Spiegel (2001), and Wheaton and Nechayev (2008).

will also begin to expand again while the economy is still suffering a downturn (Davis and Heathcote 2005, Grebler and Burns 1982, Lee 1999, Seiders 1997).

In analyzing housing and business cycles since the Second World War, Leamer (2007) argues that inflexible house prices exacerbate housing downturns when demand falls off: "If prices could quickly re-equilibrate 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" (p. 26). Indeed, Leamer found that residential investment was "consistently and substantially" the largest contributor to weakness in GDP growth prior to the start of eight of the past ten recessions, leading Leamer to conclude that housing downturns are the best indicators of a coming recession (p. 13). Furthermore, residential investment was usually the first economic sector to turn up again during a recession compared to other major sectors of the economy, such as consumer durables and nondurables, equipment and software, services and exports. This observation again confirms that housing cycles lead general business cycles, and for this reason, Leamer argues that if only the housing cycle were less frequent and less severe, the business cycle would also be less frequent and less severe.

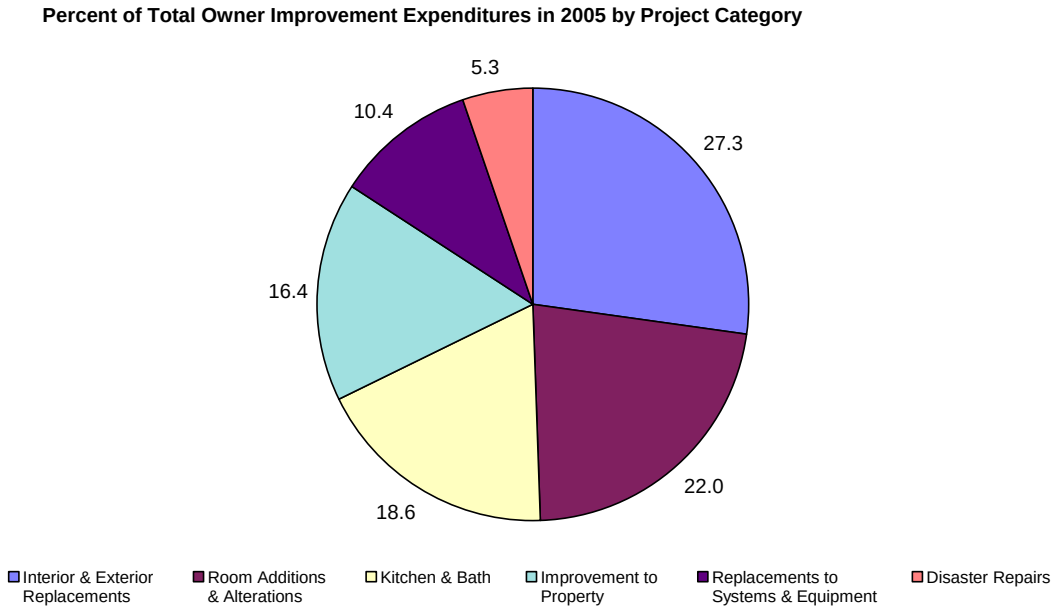
What is clear from the research on housing downturns and recoveries is that housing cycles are not regular and predictable. Housing downturns vary widely in magnitude and length, but the general pattern of housing and business cycles is that residential fixed investment weakens first, which then takes a toll on consumer durables such as appliances and home furnishings. The contraction of the business cycle that so commonly follows a housing market downturn has further negative impacts on homeowner spending decisions on first durable and then non-durable goods. Still, predicting when the housing market will begin to contract after a period of growth or begin to expand again after a downturn is very difficult. While it is easy enough to recognize that the housing market is overheating, with such signs as rapid house price appreciation, a shrinking supply of new homes for sale, and bidding wars that move properties in weeks rather than months, it is harder to know exactly when the market will turn from hot to cold, and whether the downturn will result in a soft landing or a crash.

Virtually no literature exists that specifically examines remodeling cycles separate from new residential construction;[5] again, this is likely due to the lack of quality data available for analysis. A 1997 article in *Business Economics* by David Seiders, Chief Economist for the National Association of Home Builders, briefly discusses the pro-cyclicality of the residential remodeling market (as contrary to popular belief at the time) and notes that remodeling activity experiences milder fluctuations over time compared to the homebuilding industry (p. 14). Yet, the new homebuilding and remodeling industries are certainly closely related, since both industries share common drivers and inputs. For example, many indicators of a strong economy, such as high job growth, low interest rates, stable prices, and strong consumer confidence also contribute to strength in both new construction and remodeling activity. As for inputs, both industries draw from a common construction labor force, as well as use the same construction materials.

More so than new residential construction, the remodeling industry is highly segmented. Remodeling activity includes both improvements to housing units, as well as maintenance and repairs; where improvements, such as additions and alterations, add value to the housing unit, while maintenance and repairs simply keep the property in normal working condition. Remodeling activity can also be divided into professional or do-it-yourself (D-I-Y) spending, which is a significant distinction because consumers can save substantially on labor costs by installing projects themselves—a powerful incentive particularly during downturns in the economy. Then there are the many remodeling specialties included under the broad categories of kitchen and bath, systems and equipment, and interior and exterior remodeling (see Figure 1).

[5] Analyses in the construction cycles literature commonly use the Bureau of Economic Analysis' measure of residential investment, which includes improvements to housing units. See, for example, Davis and Heathcote (2005), Grebler and Burns (1982), Leamer (2007), Lee (1999), and Seiders (1997).

Figure 1: Home Improvements Encompass Many Areas of Specialty



Notes: Interior & Exterior Replacements include roofing, siding, window, door, insulation, flooring and ceiling projects. Room Additions and Alterations include adding or replacing a deck or porch, as well as miscellaneous interior improvements. Improvements to Property include adding or replacing a garage or carport, driveways or walkways, fencing, patio, pool, septic tank and miscellaneous improvements to property. Replacements to Systems & Equipment include plumbing, electrical, HVAC and appliances.
Source: Joint Center tabulations of the 2005 American Housing Survey.

With so much segmentation in the remodeling market, one might expect the various segments to behave differently at certain points during the cycle. For example, improvements are usually more discretionary than routine maintenance and repairs, which are necessary for keeping the house in ordinary working condition. For this reason, improvement spending is expected to be much more cyclical and more sensitive to upturns and downturns in the general economy, whereas maintenance and repair spending is expected to be fairly stable over time. Similarly, it is expected that high-end discretionary projects would be more sensitive to changes in the remodeling cycle than more routine and less costly improvements and repairs.

III. Methodology

A variety of methods can be used for identifying and assessing the cyclical nature of time series data. For example, finding the percentage difference between the observed values and those that are predicted by the long-term trend in the data will clearly show any significant deviations from the trend.[6] Another, more intuitive method involves calculating the percent change from year-to-year in same quarter spending levels, which helps to control for seasonality in the data, but does little to smooth a particularly volatile data series, such as the C-50. In this study, the method chosen for identifying and analyzing cyclical activity in remodeling involves the calculation of annual rates of change in nominal spending levels of homeowner improvements and repairs using the U.S. Census Bureau's Expenditures for Residential Improvements and Repairs series, commonly known as the C-50 series. The C-50 is estimated on a quarterly basis, and this annual rate of change is simply the total amount of expenditure over four consecutive quarters relative to the amount of spending in the prior four quarters, which then results in a four-quarter, or year-over-year, rate of change in remodeling spending. This method was chosen because analyzing activity on a quarterly basis as a rate change from one four-quarter period to another serves to both remove seasonality and also smooth a notoriously volatile data series.[7]

So as to compare remodeling cycles with cycles in homebuilding and overall economic activity, four-quarter moving rates of change were also calculated in the Census Bureau's quarterly estimates of the value of new single family construction put in place (C-30 series) and in estimates of nominal GDP levels from the Bureau of Economic Analysis. See Appendix Table A-1 for quarterly estimates and the associated four-quarter moving rates of change in remodeling, new construction and GDP.

The time period under analysis spans about 20 years from the first quarter of 1985 to the fourth quarter of 2007. While the Census Bureau has collected remodeling data since the 1960s, there have been several significant changes in survey methods over the years. Most significantly, in 1984 the Census Bureau discontinued use of the Survey of Residential Alterations and Repairs (SORAR) to estimate owner-occupied remodeling expenditures in favor of the Consumer Expenditure Survey (CES). Unlike the SORAR, the CES was not designed to

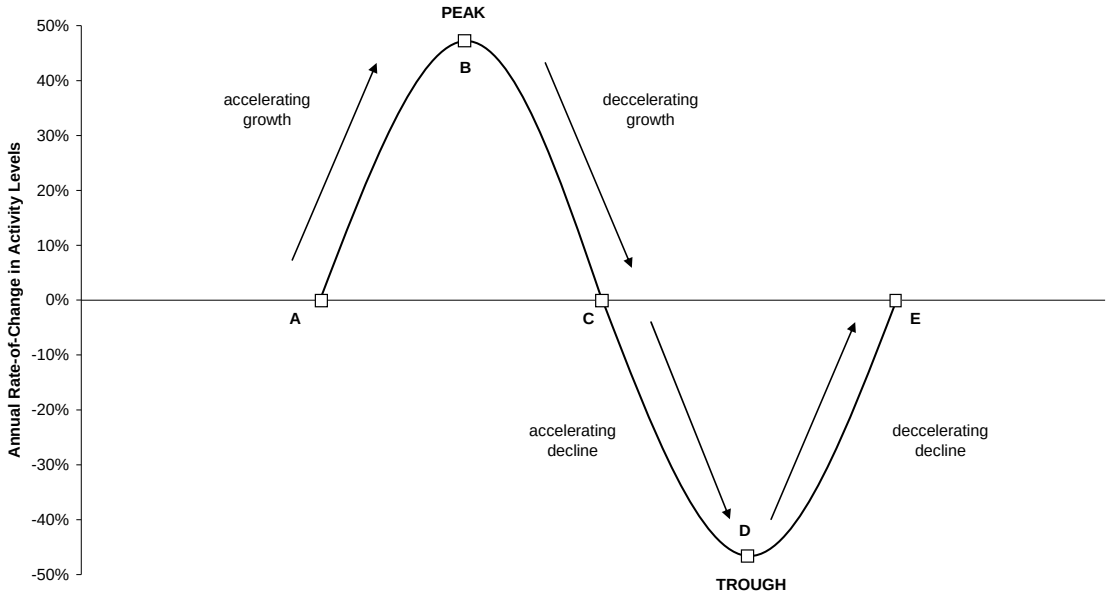
[6] See the appendix in Grebler and Burns (1982).
[7] See Bendimerad (2007) for a discussion of the unusually volatile nature of the C-50 estimates.

specifically collect data on remodeling spending, but rather to comprehensively survey consumer spending habits. This major change in surveys is the reason for limiting this analysis of remodeling cycles to a relatively short time frame of twenty years. This time period between 1987 and 2007 only includes two recessionary periods in the economy, and of course a longer timeline would be able to provide much more information for inferring cyclical patterns.

The interpretation of cycles is fairly straightforward, particularly if the term "cycle" is not taken too literally, since the upturns and downturns in economic activity are not very regular or predictable. In looking at annual rates of change in spending levels, a complete cycle consists of four phases: accelerating growth, decelerating growth, accelerating decline, and decelerating decline (see Figure 2). The baseline is 0 percent annual rate of change in activity levels, and the peak of the cycle is defined as the maximum growth rate (point B). This is the turning point in the cycle from a period of accelerating growth, in which annual growth rates increase from one quarter to the next, to a period of decelerating growth, in which growth rates move downward with time. In the next phase of the cycle, year-over-year declines in activity levels become greater (or more negative) with each quarter until reaching the trough of the cycle, defined as the minimum year-over-year rate of change (at point D). The trough of the cycle is thus the turning point from a period of accelerating decline to a period of decelerating decline, in which annual declines become smaller (or less negative) with time.[8]

[8] Of course, measuring cyclical activity as a rate of change in spending levels is just one method for assessing non-seasonal and non-random fluctuations in the industry. More commonly, remodeling peaks and troughs are thought of in terms of the level of expenditure, or the number of starts in the case of homebuilding.

Figure 2: The Four Phases of a Cycle in Annual Rates of Change



Annual growth rates remain positive as the cycle moves from point A to C, and thus the *level* of activity continues to grow on an annual basis, only it grows at a lesser rate after passing the peak of the cycle. For this reason, spending reaches a maximum level when the rate of change in spending moves from that of growth to decline (at point C). Then as the cycle moves from point C to E, annual activity levels continue to fall, first at an increasing rate and then a decreasing rate, until a minimum level is reached as the cycle moves from a period of decline to growth once again (point E). The peak and trough of the cycle are key signals that the current trend of growth or decline will soon change.

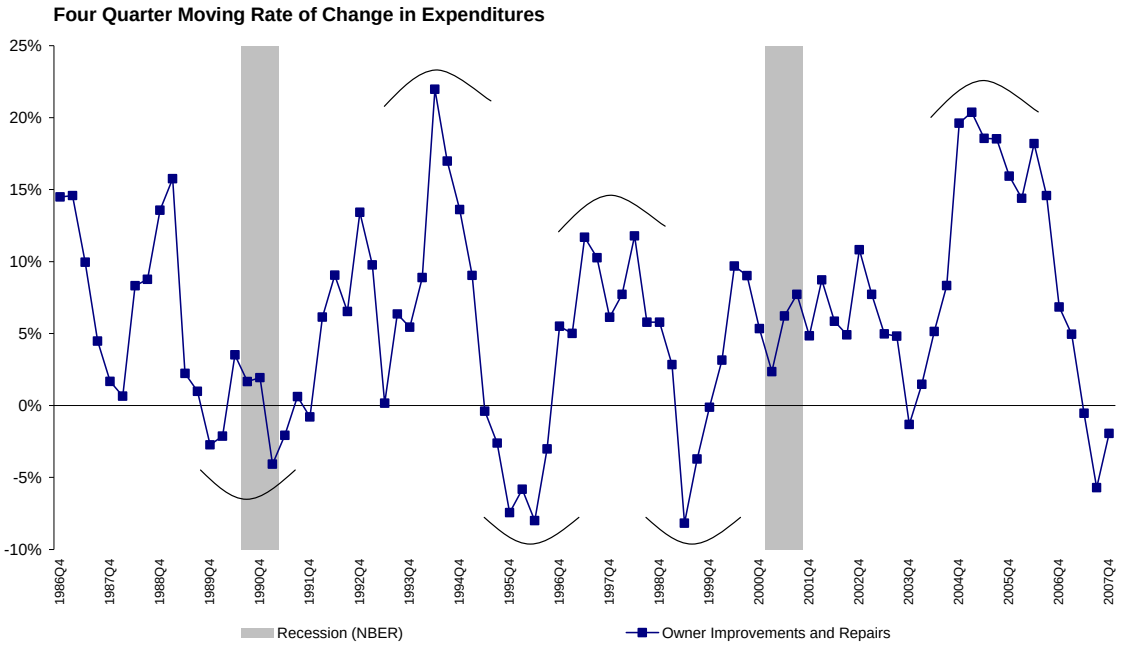
IV. Recent Cycles in Remodeling, Homebuilding and GDP

Cycles in Remodeling Spending

As seen in Figure 3, remodeling activity is highly cyclical.[9] Although identifying the precise beginning and ending of a cycle is somewhat subjective, it appears that there have been three distinct remodeling cycles over the past twenty years. The first of these trough-to-trough cycles began during or shortly after the recession of 1990-91 and ended about five years later. The second cycle, lasting only about three years, started in early 1996 and ended prior to the 2001 recession. The third and current cycle is already about twice as long as the previous two cycles at 34 quarters and counting, which is more than eight years. The current remodeling cycle experienced several years of solid growth at 6.5 percent on average before climbing steadily to a peak of more than 20 percent year-over-year growth in the first quarter of 2005. The average annual growth over the past twenty years was 5.9 percent, though there was certainly a great deal of variation around this mean. During this time, remodeling spending reached a maximum year-over-year growth rate of 22.0 percent in 1994, while the greatest annual decline occurred in the second quarter of 1999 with a year-over-year decline of -8.2 percent.

[9] This analysis of remodeling cycles is restricted to improvements and repairs made to owner-occupied properties (both single family and multi-family); yet spending for improvements and repairs by owners of rental properties makes up a significant share of the total residential remodeling market, averaging 32 percent of quarterly spending between 1987 and 2007. The reason for excluding rental remodeling activity from this analysis is simply poor data quality. Quarterly remodeling expenditures for rental units are estimated using a very small sample size of about 4,000 rental property owners. A smaller sample size results in higher sampling error, meaning that a small sample is less likely to accurately represent remodeling activity at the national level.

Figure 3: Three Distinct Remodeling Cycles in 20 Years



Source: U.S. Census Bureau Residential Improvements and Repairs Statistics (C-50) and National Bureau of Economic Research.

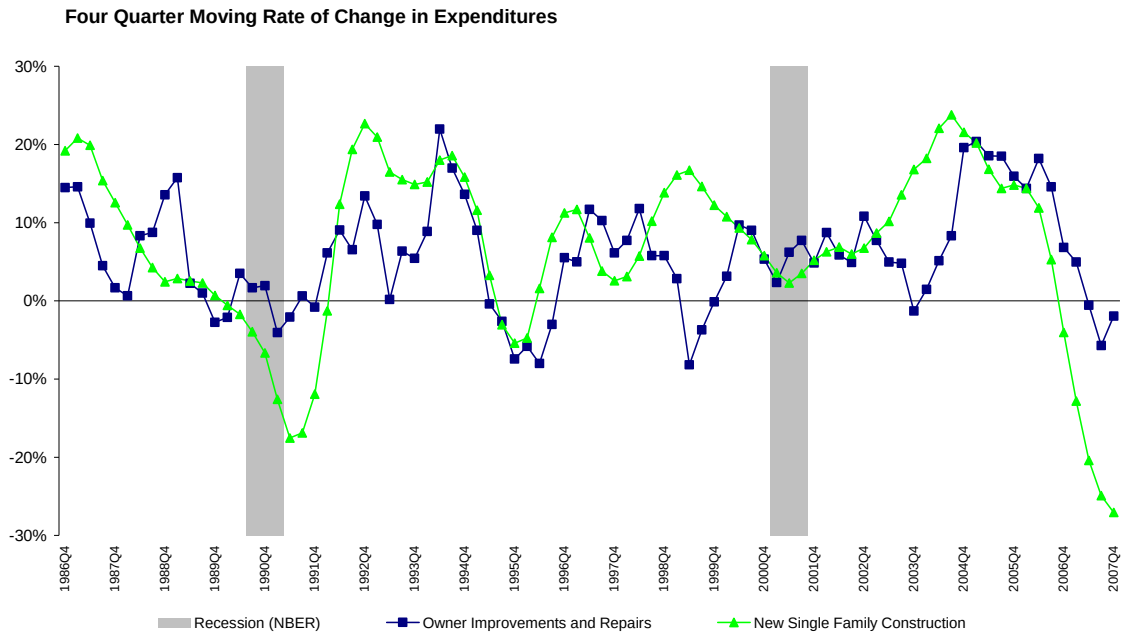
The convergence of several unique factors that led to an extremely strong housing market greatly influenced the magnitude and length of the current remodeling cycle. The unprecedented rise in house price appreciation beginning in the mid to late 90s created significant amounts of home equity. That, coupled with historically low interest rates and greater access to credit, made refinancing and cashing-out of equity very attractive for many homeowners, and fueled the current cycle to peak at about twice the annual growth rate of the previous cycle. Many homeowners took advantage of the unique economic situation by using cashed-out equity to particularly make upper-end discretionary improvements, such as major kitchen and bath remodels. Now with the credit crunch and the economy turning down once again, homeowners are curbing improvement spending, and there is little to indicate that the current remodeling cycle has yet to reach a bottom.

Comparing Remodeling and New Construction Cycles

In comparing the annual rates of change in remodeling expenditures with estimates of new single family construction spending (from the Census Bureau's C-30 series), it is clear that both new construction and remodeling are very cyclical industries that tend to follow similar

patterns of upturn and downturn (see Figure 4). The remodeling and new construction cycles observed over the past twenty years have been of similar magnitude, yet construction cycles tend to peak a little higher and reach lower troughs than remodeling cycles. Year-over-year rates of change in remodeling expenditures remained between -8 percent and 22 percent for a range of 30 percentage points, while rates of change in new construction spending moved within a significantly larger range of 51 percentage points (between -27 percent and 24 percent). During this time period, the four-quarter moving rate of change in remodeling expenditures averaged 5.9 percent year-over-year growth, with new residential construction averaging 7.0 percent year-over-year growth.

Figure 4: Remodeling and Residential Construction Follow Similar Cycles



Source: U.S. Census Bureau Residential Improvements and Repairs Statistics (C-50) and Value of Private Construction Put in Place (C-30), and National Bureau of Economic Research.

The same general pattern of cyclicality during this time period suggests that the two industries are strongly related. A simple correlation of the four-quarter moving rates of change between 1987 and 2007 results in a modestly strong, positive correlation coefficient of 0.51. Increasing the lead of new construction over remodeling by one quarter results in essentially the same correlation coefficient (0.52), while greater lead times result in substantially weaker correlations. This suggests that residential construction generally had a small lead (three months

or less), if any, over remodeling activity during this time period. However, this leading relationship varies considerably for each individual cycle. For example, the correlation coefficient for the early 90s cycle is strongest with no lead or lag in residential construction (0.73), which means that the growth and decline in remodeling activity occurred simultaneously with the growth and decline in construction. Alternatively, during the late 90s cycle, remodeling and residential construction are most strongly correlated when residential construction has a two quarter lead over remodeling (0.83). And as for the current cycle, the correlation between remodeling and residential construction is strongest when residential construction has a two or three quarter lead over remodeling activity (0.77 and 0.79 respectively).[10]

Certainly periods of growth and decline in the remodeling and homebuilding industries generally coincide. In 70 of 85 quarters (82 percent) between 1987 and 2007 new construction and remodeling both experienced either year-over-year growth or decline in any given quarter. Both industries experienced annual growth in 60 quarters (70 percent) and decline in only 10 quarters (12 percent). The co-movement of remodeling activity and new construction is also rather close over this twenty year time period. A complete understanding of how the cycles move together must take into consideration the four stages of a full cycle: decelerating decline and accelerating growth (as the cycle moves from trough to peak), and decelerating growth and accelerating decline (as the cycle moves from peak to trough). Overall, in 50 of 84 movements from one quarter to another, the annual rate of change in remodeling and new construction moved together, either up the cycle from trough to peak or down the cycle from peak to trough. This is a relatively strong relationship given the highly erratic nature of the C-50 data from quarter to quarter compared to new construction.

Table 1 summarizes the comparisons between remodeling and new construction cycles. Remodeling cycles tend to last longer in total than homebuilding cycles, but experience shorter periods of downturn: 8 quarters from peak to trough compared to 12 quarters for new construction during the early 90s cycle, 4 quarters compared to 8 in the late 90s cycle, and 11 and counting compared to 13 and counting for the current cycle. Also, remodeling cycles are less varied than new construction cycles. The previous two remodeling cycles hit bottom with 8

[10] While it seems that the lead of residential construction over remodeling is increasing with time, significant data revisions were made to some or all of the historical C-50 estimates in 1999 making it difficult to fully compare data from the current cycle to previous cycles. The estimates were all revised upward at the time, and while the reasons are undocumented it might have been due to issues with household weighting.

percent annual declines, while the current cycle has thus far reached a low of close to 6 percent decline, though there are no indications the current cycle has reached a bottom. Yet, recent new construction cycles have bottomed out with no such consistency. The annual rate of change in new construction spending levels bottomed out at +2.3 percent at the end of the late 90s cycle, while the downside of the current cycle has so far sunk to a -27.1 percent decline.[11] The average decline in annual expenditures from the peak of the cycle to the trough for the past three cycles is -8.0 percent for remodeling spending compared to -8.7 percent for new construction.

Table 1: Remodeling Downturns Shorter, Less Volatile than for Homebuilding

Cycle from Trough to Trough	Total Duration (in quarters)	Duration of Downturn (in quarters)	Annual Rate of Change at Peak	Annual Rate of Change at Trough	Percent Change in Annual Totals, Peak to Trough
Remodeling Spending					
Early 90s	21	8	22.0%	-8.0%	-10.1%
Late 90s	12	4	11.8%	-8.2%	-8.3%
2000s	34+	11+	20.4%	-5.7%	-5.7%
New Construction Spending					
Early 90s	18	12	22.7%	-5.4%	-5.4%
Late 90s*	22	8	16.7%	2.3%	11.8%
2000s	25+	13+	23.8%	-27.1%	-32.6%

Note: Figures for the 2000s cycles are calculated using data through the fourth quarter of 2007, though the actual troughs of the current cycles are yet to be determined.
*Again, since the late 90s homebuilding cycle did not see year-over-year declines, some may not consider this a separate cycle from the current cycle. While the annual growth rate in homebuilding did steadily decline in the late 90s, the industry still grew considerably over this time period.
Sources: Joint Center tabulations of U.S. Census Bureau Residential Improvements and Repairs Statistics (C-50) and Value of Private Construction Put in Place.

Of course, both remodeling and new construction spending are fairly volatile, yet residential construction is somewhat more volatile.[12] A common measure of this volatility, or variability, in time-series data is the standard deviation from the mean. A low standard deviation

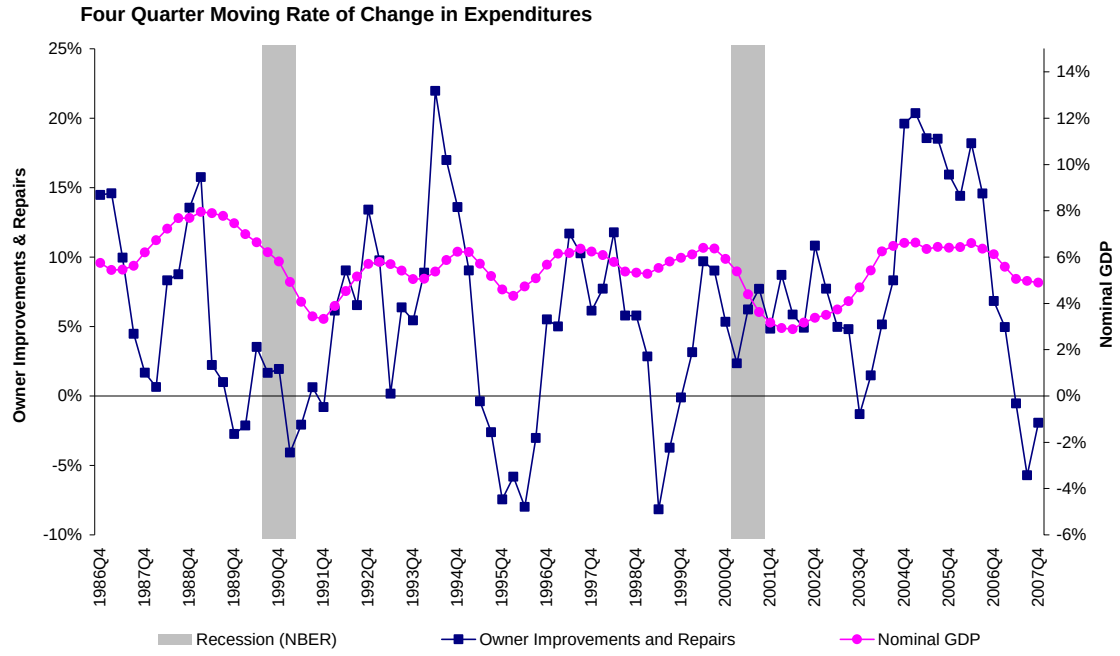
[11] Again, defining the exact start and end date of a cycle is somewhat subjective, and since new residential construction spending did not actually decline at an annual rate during the 2001 recession, one might argue that new construction has experienced only two cycles in the past twenty years, with the current cycle beginning in the mid 1990s, peaking in 2004 and hitting declines by the end of 2006.
[12] Some of the volatility in homeowner improvements and repairs spending might be explained by the frequency of the estimates, which is quarterly, and also remodeling expenditures are estimated at the national level from a very small sample size of about 7,500 households. Homeowners are interviewed for five consecutive quarters, but households that move between interviews are dropped from the survey, thus not capturing any remodeling that might occur in the time period after the last interview and before the move.

means that the data do not vary much, or stray too far, from its average value over time. On the other hand, a high standard deviation means that the data are highly dispersed from the mean. Indeed, remodeling expenditures have a standard deviation of 6.9 percentage points from its mean annual growth rate, while new construction spending has a considerably larger standard deviation of 11.1 percentage points from its mean. This higher standard deviation conveys the fact that new construction spending tended to reach appreciably higher rates of growth and lower rates of decline than remodeling during the past two decades.

Comparing Remodeling and GDP Cycles

Certainly the remodeling and homebuilding industries are highly cyclical, especially when compared to movements in the overall economy. As seen in Figure 5, the business cycle is significantly more stable than remodeling activity. Still, the year-over-year rate of change in nominal GDP levels tends to move in the same general direction as remodeling and new construction, which implies that remodeling activity is pro-cyclical with the business cycle. In fact, despite major differences in magnitude and volatility, homeowner remodeling spending moves fairly closely with nominal GDP. The annual growth rates for remodeling and nominal GDP either increased together or decreased together from one quarter to the next in 51 of 84 quarters (61 percent), which is essentially the same relationship in co-movement as found between remodeling and new construction. The annual growth rates for remodeling and GDP showed either decelerating decline or accelerating growth in 23 quarters (28 percent), and either decelerating growth or accelerating decline in 28 quarters (34 percent).

Figure 5: Remodeling Activity is Generally Pro-Cyclical with Overall Economy



Source: U.S. Census Bureau Residential Improvements and Repairs Statistics (C-50) , Bureau of Economic Analysis and National Bureau of Economic Research.

Unlike remodeling and new residential construction cycles, the magnitude of nominal GDP cycles has been very small over the past two decades, which is a sign of a very stable economy. Year-over-year growth rates in nominal GDP levels have moved within a very narrow band of about 3 percent and 8 percent, or a range of only five percentage points between 1987 and 2007. During this time period, the four-quarter moving rate of change in nominal GDP levels averaged 5.6 percent, which is slightly less than the much more volatile remodeling industry. A correlation of the four-quarter moving rates of change in remodeling and nominal GDP results in a positive, but low correlation coefficient of 0.27, yet a one quarter lead over GDP results in about the same correlation (.28). This suggests that there might be some lead in remodeling activity relative to broader economic activity. This is expected since the remodeling industry, much like the homebuilding industry, is fairly sensitive to changing interest rates, a key driver of the business cycle. For example, research has shown that a significant share of mortgage refinancing goes toward home improvements.[13]

[13] See Canner et al. (2002).

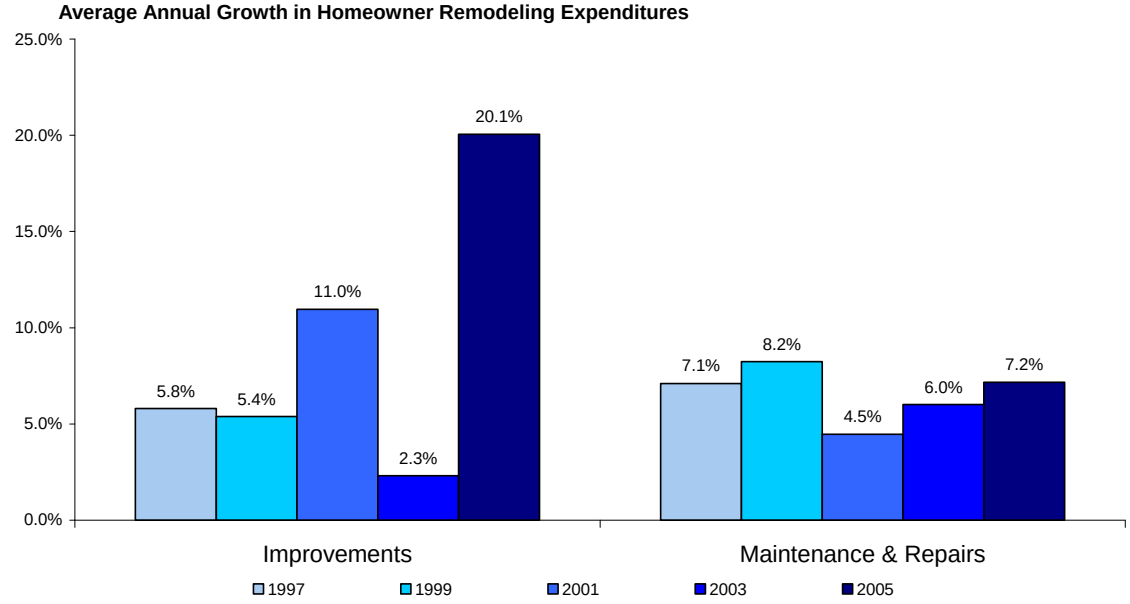
V. Decomposition of Remodeling Cyclicality

As mentioned previously, the remodeling industry is highly segmented. Deconstructing remodeling spending into its various components, such as improvements and maintenance spending, professional and D-I-Y remodeling, and spending by the various project types allows for the assessment of the cyclicality of each component in order to understand which segments of the remodeling market might be more or less volatile, or more or less affected by the cycle. While data quality issues limit the reliability of a cyclical analysis of this nature for homeowner improvement and maintenance spending using the C-50 series, a related analysis can be conducted using the American Housing Survey (AHS).[14] The AHS surveys the same housing units at two year intervals, although the sample is adjusted with each survey to account for removals and new additions to the housing stock. Since each survey captures remodeling data from a two-year time period, it is not possible to conduct a cyclical analysis using AHS data, meaning that it is not possible to track cyclical highs and lows or identify exact turning points in the cycle. Still, a panel analysis using successive surveys shows changes in aggregate improvement and maintenance activity from one time period to the next, which provides an indication of the broad trend in this activity over time.

Figure 6 shows that growth in total expenditures for home improvements, including additions, alterations and replacements, vary greatly from one survey year to the next, while maintenance and repair spending has grown steadily over time. Improvement spending increased an average of 11.0 percent a year between 1999 and 2001, but only averaged 2.3 percent a year over the following two-year period, which was likely due to recessionary conditions in the overall economy. Then, from 2003-2005 improvement spending increased over 20 percent a year on average as the housing and remodeling markets skyrocketed to new heights. On the other hand, owner expenditures for routine maintenance and repairs grew at a stable rate from year to year between 1995 and 2005, indicating that the improvements segment of remodeling activity is very cyclical, while the maintenance segment is not nearly as affected by changes in the cycle.

[14] Even though the AHS is not as timely as the C-50, only being conducted once every other year, the AHS is a much richer dataset compared to the C-50 with a larger sample size and much greater detail on homeowner and project characteristics. Also, a 2003 report from the Manufacturing and Construction Division of the U.S. Census Bureau explains the difficulty in accurately and fully separating improvement and repair spending in the C-50 (Rappaport and Cole). In particular, materials purchased for a job not yet started could be recorded in the CES as either a specific type of improvement or general materials to have on hand, which is then considered to be maintenance and repair spending.

Figure 6: Homeowner Improvement Spending is More Volatile than Maintenance Spending



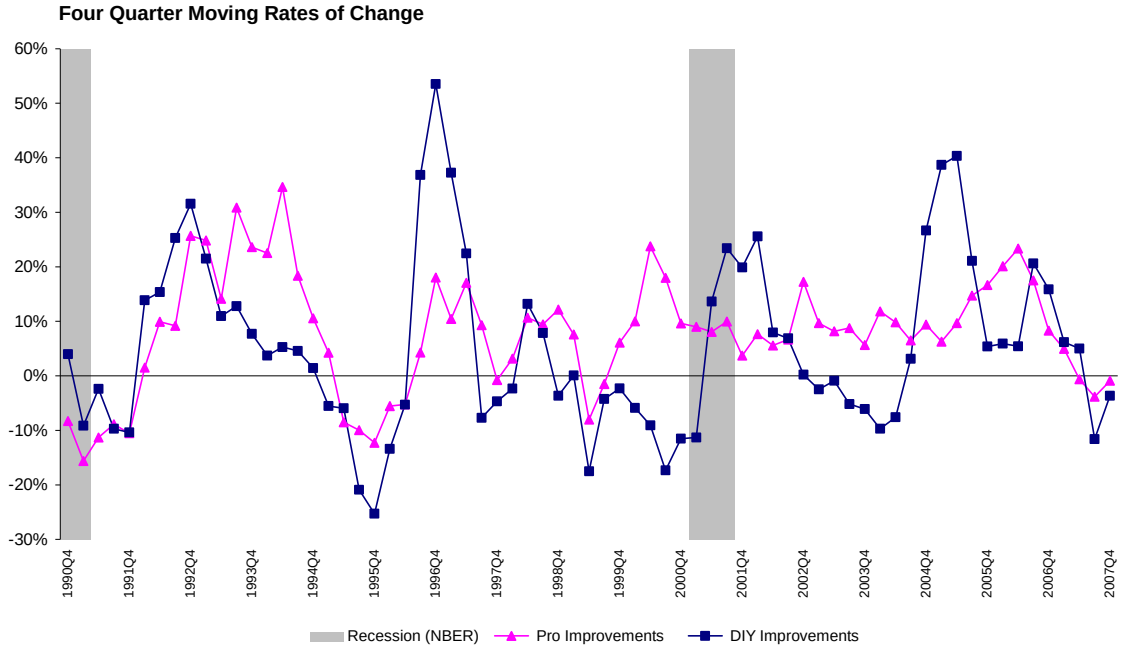
Source: Joint Center tabulations of 1995-2005 American Housing Surveys.

Returning once again to the quarterly C-50 estimates for analyzing the decomposition of improvement spending into professional and D-I-Y expenditures shows that a very high percentage of total improvement spending on single family homes goes toward professional contractors or hired labor, averaging 86 percent of total spending per quarter from 1989 to 2007.[15] Over this period, the four-quarter moving rate of change in professional remodeling expenditures averaged 6.4 percent annually, with D-I-Y spending averaging 4.7 percent year-over-year growth. Figure 7 shows that D-I-Y spending generally moves in line with professional spending, which is somewhat contrary to expectations. Instead of substituting for professional spending, D-I-Y tends to complement professional spending. The similar patterns of growth and decline in professional and D-I-Y improvement expenditures between 1991 and 2007 are reflected by a fairly strong, positive correlation coefficient of 0.41, and the fact that the rate of change in professional and D-I-Y improvements moved in the same direction in 45 of 68 quarters, or 66 percent. Nevertheless, leading up to and during the last recession D-I-Y and professional spending trends completely diverged as D-I-Y growth accelerated while growth in

[15] The C-50 provides a breakdown of remodeling spending into professional and D-I-Y for single family homes only with limited historical data going as far back as 1989.

professional spending slowed. The associated correlation coefficient of -0.39 indicates a fairly strong inverse relationship between professional and D-I-Y spending during this time period. The abrupt strengthening of year-over-year growth in D-I-Y spending in the middle of a recession suggests that during a weakened economy relatively less costly D-I-Y projects are favored over hiring professional contractors to perform improvements. Otherwise, during periods of economic growth, D-I-Y expenditures tend to complement professional remodeling spending.

Figure 7: Pro and DIY Improvement Spending Tends to Move Together



Source: U.S. Census Bureau Residential Improvements and Repairs Statistics (C-50) and National Bureau of Economic Research.

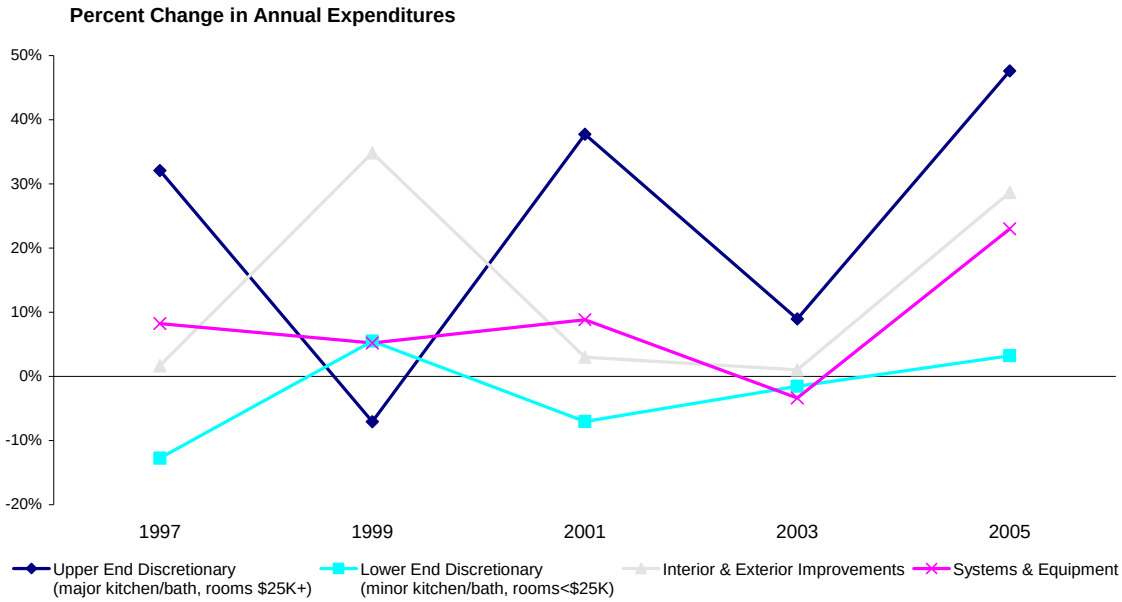
Another noticeable feature of professional and D-I-Y remodeling cycles is that D-I-Y spending seems to be more volatile than professional spending. The annual rates of change in D-I-Y improvement spending varied widely from a low of -25 percent to a high of 54 percent, whereas professional spending only varied between -16 percent and 35 percent. In fact, the annual change in professional remodeling spending had a standard deviation of 7.1 percentage points from its mean, while D-I-Y spending had more than twice the amount of deviation at 15.9

percentage points. However, the erratic movements in year-over-year D-I-Y spending might be partly explained by the mix of D-I-Y projects compared to professional projects.[16]

Once more, data from the AHS can be used to supplement this cyclical analysis of professional and D-I-Y remodeling as estimated in the C-50. An assessment of remodeling spending by project type finds that spending for some types of projects seems to be very volatile over time, while other types appear to be much more stable (see Figure 8). For example, the two-year rate of change in spending for high-end discretionary projects, such as major kitchen and bath remodels and room additions is incredibly uneven from one period to the next, and also seems to follow the cycle very closely. 1999 was a period of slowing growth and then decline in the C-50 (start of the current cycle), and the AHS data shows spending for upper-end projects was also down significantly in 1999 from two years prior. During 2001 when remodeling activity was experiencing solid annual growth, upper-end discretionary spending also grew significantly—again, rising house prices and low interest rates at the time started to fuel these high end additions and alterations. Then in 2003 the C-50 was showing some weakness, and while upper-end projects did still see positive growth during this time, it was much less than in 2001. Finally, in 2005 two year growth in spending for high-end remodeling jumped up again as the peak of the current remodeling cycle neared.

[16] Of course, another possible reason for such extreme volatility in D-I-Y improvement spending is problems with data quality. The sample size for estimating total improvements and repairs at the national level is quite small, but slicing the data into finer detail pushes the limits of data reliability. Also, the smaller the sample size, the higher the sampling error, which is reflected in the relative standard error (RSE) of the estimate. For example, the RSE in the third quarter of 2007 for professional improvement spending was rather high at 10 percent, but the RSE for D-I-Y improvement spending was more than double that at 22 percent. Higher standard errors imply that expenditure estimates are less accurate and thus less likely to reflect true levels of remodeling activity.

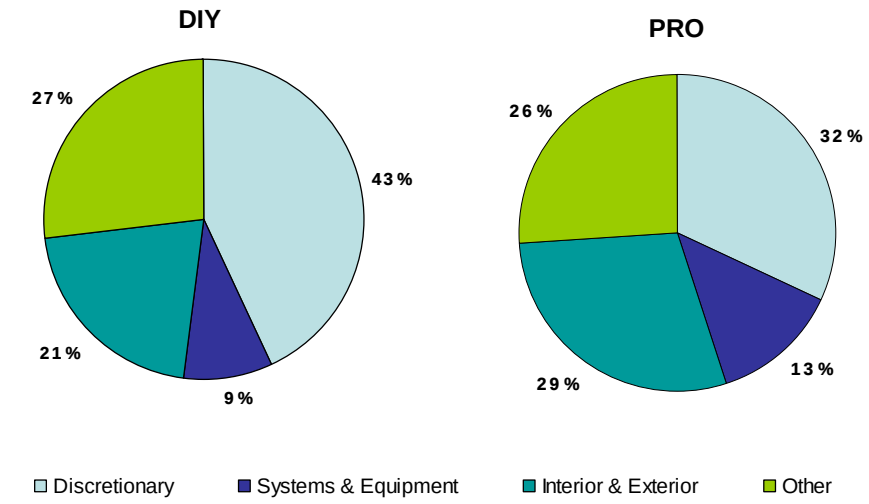
Figure 8: Upper End Discretionary Projects are Highly Cyclical



Notes: Expenditures are inflation-adjusted to 2005 dollars. Major kitchen improvements are defined as $10,000+ if done professionally and $4,000+ if DIY. Major bathroom improvements are defined as $5,000+ if done professionally and $2,000+ if DIY.
Source: Joint Center tabulations of 1995-2005 American Housing Surveys.

Whereas spending for upper end discretionary projects is very cyclical, lower end kitchen, bath and room additions and alterations, as well as systems and equipment replacements remain relatively stable throughout. These are the more routine and less costly projects, which are not nearly as affected by the cycle. Again using data from the AHS, on average 43 percent of total annual D-I-Y spending was for discretionary projects between 1995 and 2005, but only 32 percent of total professional spending was for discretionary projects, which are more and more affected by the cycle (see Figure 9). On the other hand, spending for jobs that are more likely to be done professionally, such as plumbing, electrical, and HVAC tend to be very stable over time, and in fact a greater share of professional expenditure was for systems and equipment improvements at 13 percent compared to 9 percent of total D-I-Y expenditure.

Figure 9: DIY Remodeling Includes Greater Share of Highly Cyclical Project Types



Notes: Discretionary projects include kitchen and bath improvements, as well as room additions and alterations. Other includes improvements to garage and deck/porch, disaster repairs and miscellaneous improvements.
Source: Joint Center tabulations of 1995-2005 American Housing Survey.

VI. Conclusion

This analysis of remodeling cycles found that owner improvement and repair activity is pro-cyclical, tending to move in line with new residential construction spending and the general business cycle. While remodeling activity is highly cyclical and volatile, it is still less volatile than homebuilding activity. As expected, improvement spending tends to be much more affected by changes in the cycle, while maintenance and repair spending remains relatively steady over the years. As for which type of projects are more or less sensitive to changes in the cycle, it is high-end discretionary spending that is most sensitive and cyclical, while improvements to systems and equipment are much more stable over time. This has implications for the higher volatility found in D-I-Y spending compared to professional spending, since a much greater share of D-I-Y spending goes toward these highly cyclical discretionary projects.

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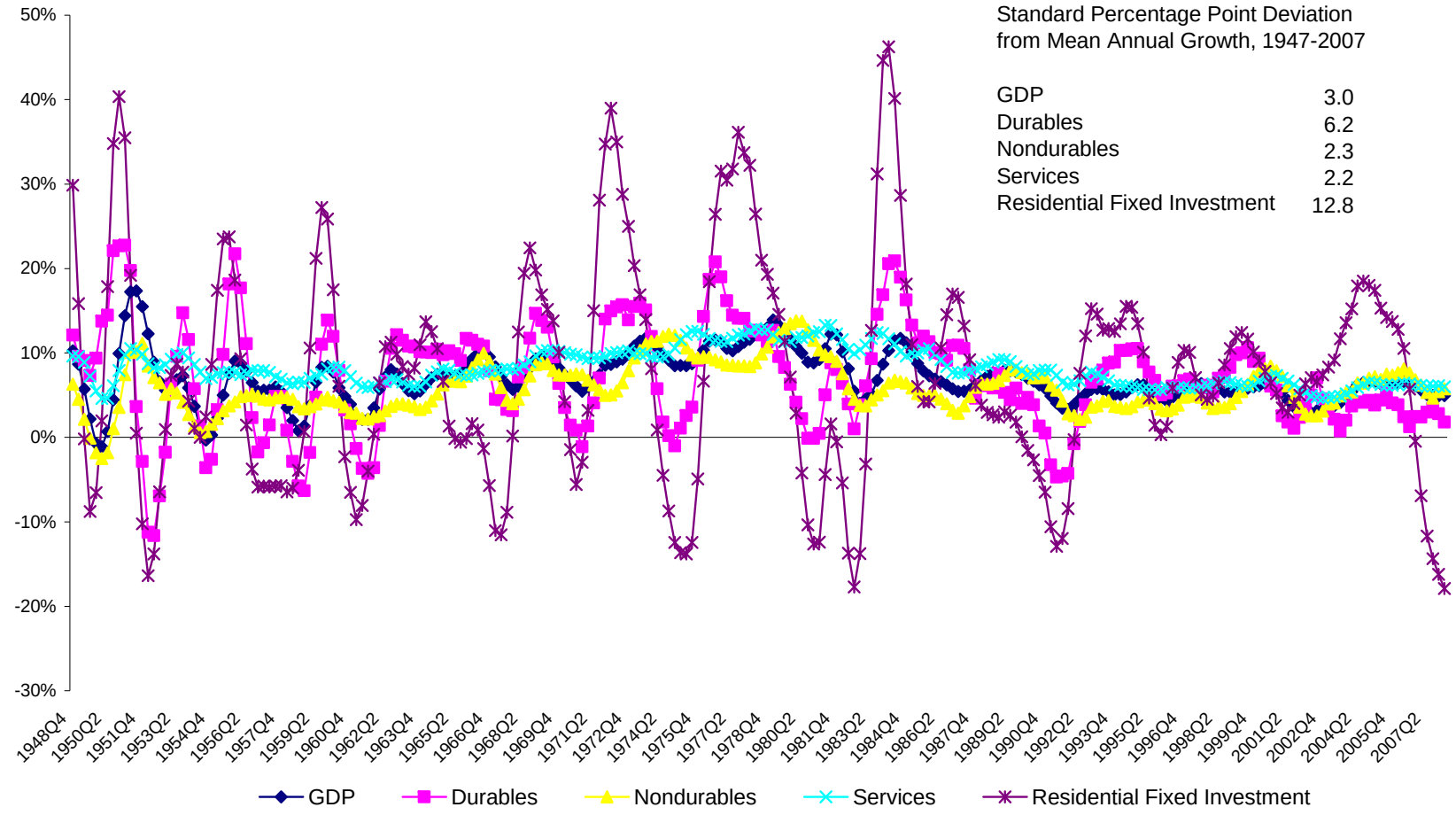
Appendix A-1: Residential Fixed Investment is Highly Cyclical Relative to Other Major Economic Sectors & GDP

Four Quarter Moving Rate of Change in Expenditure (SAAR)



Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Appendix A-2: Levels and Rates of Change in Remodeling, New Residential Construction and Nominal GDP, 1985-2007

	Expenditures for Residential Improvements and Repairs (C-50)	Four-Quarter Moving Rate of Change	Value of Private Residential Construction (C-30)	Four-Quarter Moving Rate of Change	Nominal Gross Domestic Product	Four-Quarter Moving Rate of Change
	Owner Occupied (Mil.$, NSA)	C-50	New Single Family (Mil.$, NSA)	C-30	(Bil.$, SAAR)	GDP
1985Q1	9,649		17,242		4,120	
1985Q2	13,894		22,093		4,178	
1985Q3	14,161		25,180		4,261	
1985Q4	13,632		22,836		4,322	
1986Q1	10,141		19,104		4,386	
1986Q2	16,148		25,993		4,426	
1986Q3	17,814		31,293		4,494	
1986Q4	14,667	14.5%	27,742	19.2%	4,546	5.7%
1987Q1	10,758	14.6%	22,751	20.8%	4,614	5.4%
1987Q2	16,226	10.0%	29,858	19.9%	4,690	5.5%
1987Q3	18,671	4.5%	34,146	15.4%	4,768	5.6%
1987Q4	14,096	1.7%	30,461	12.6%	4,886	6.2%
1988Q1	10,778	0.6%	23,799	9.7%	4,952	6.7%
1988Q2	20,869	8.3%	30,772	6.7%	5,063	7.2%
1988Q3	19,866	8.8%	34,352	4.3%	5,147	7.7%
1988Q4	16,341	13.6%	31,169	2.5%	5,254	7.7%
1989Q1	12,112	15.8%	25,366	2.9%	5,367	8.0%
1989Q2	17,533	2.2%	31,315	2.5%	5,454	7.9%
1989Q3	20,272	1.0%	34,274	2.3%	5,532	7.8%
1989Q4	16,078	-2.7%	29,975	0.7%	5,584	7.5%
1990Q1	13,836	-2.1%	25,385	-0.6%	5,716	7.0%
1990Q2	17,985	3.5%	30,454	-1.7%	5,798	6.6%
1990Q3	19,464	1.7%	31,502	-3.9%	5,849	6.2%
1990Q4	15,987	1.9%	25,546	-6.7%	5,849	5.8%
1991Q1	11,523	-4.1%	18,215	-12.6%	5,888	4.9%
1991Q2	19,786	-2.1%	23,784	-17.5%	5,964	4.1%
1991Q3	20,489	0.6%	29,963	-16.9%	6,036	3.4%
1991Q4	14,938	-0.8%	27,466	-11.9%	6,096	3.3%
1992Q1	13,735	6.1%	23,156	-1.3%	6,196	3.9%
1992Q2	23,635	9.0%	30,725	12.4%	6,290	4.5%
1992Q3	19,901	6.5%	35,061	19.4%	6,381	5.2%
1992Q4	18,416	13.4%	33,035	22.7%	6,484	5.7%
1993Q1	13,730	9.8%	27,401	20.9%	6,543	5.8%
1993Q2	20,870	0.2%	34,164	16.5%	6,612	5.7%
1993Q3	23,788	6.4%	39,876	15.5%	6,675	5.4%
1993Q4	21,412	5.4%	38,683	14.9%	6,800	5.0%
1994Q1	16,335	8.9%	32,700	15.2%	6,911	5.1%
1994Q2	27,400	22.0%	41,758	18.0%	7,031	5.4%
1994Q3	24,699	17.0%	46,329	18.6%	7,115	5.9%
1994Q4	22,223	13.6%	41,522	15.8%	7,232	6.2%
1995Q1	15,529	9.0%	32,689	11.6%	7,298	6.2%
1995Q2	26,137	-0.4%	37,468	3.3%	7,338	5.7%
1995Q3	23,612	-2.6%	42,946	-3.0%	7,432	5.2%
1995Q4	18,632	-7.4%	40,412	-5.4%	7,523	4.6%
1996Q1	16,245	-5.8%	33,770	-4.7%	7,624	4.3%
1996Q2	23,016	-8.0%	43,396	1.6%	7,777	4.7%
1996Q3	26,961	-3.0%	49,602	8.1%	7,866	5.1%
1996Q4	22,310	5.5%	44,023	11.3%	8,000	5.7%

Appendix A-2 cont.: Levels and Rates of Change in Remodeling, New Residential Construction and Nominal GDP, 1985-2007

	Expenditures for Residential Improvements and Repairs (C-50)	Four-Quarter Moving Rate of Change	Value of Private Residential Construction (C-30)	Four-Quarter Moving Rate of Change	Nominal Gross Domestic Product	Four-Quarter Moving Rate of Change
	Owner Occupied (Mil.$, NSA)	C-50	New Single Family (Mil.$, NSA)	C-30	(Bil.$, SAAR)	GDP
1997Q1	16,570	5.0%	35,655	11.7%	8,114	6.2%
1997Q2	25,194	11.7%	44,168	8.1%	8,250	6.2%
1997Q3	29,493	10.3%	49,732	3.8%	8,382	6.4%
1997Q4	22,705	6.1%	45,624	2.6%	8,471	6.2%
1998Q1	18,324	7.7%	38,540	3.1%	8,587	6.1%
1998Q2	31,241	11.8%	49,504	5.7%	8,658	5.8%
1998Q3	26,716	5.8%	57,597	10.2%	8,790	5.4%
1998Q4	23,119	5.8%	53,770	13.8%	8,954	5.3%
1999Q1	17,363	2.8%	45,858	16.1%	9,067	5.3%
1999Q2	26,251	-8.2%	56,832	16.7%	9,174	5.5%
1999Q3	28,565	-3.7%	62,826	14.7%	9,314	5.8%
1999Q4	27,102	-0.1%	58,321	12.2%	9,520	6.0%
2000Q1	19,622	3.2%	51,000	10.8%	9,629	6.1%
2000Q2	27,216	9.7%	61,880	9.3%	9,823	6.4%
2000Q3	29,955	9.0%	65,276	7.8%	9,862	6.4%
2000Q4	27,791	5.3%	58,632	5.8%	9,954	5.9%
2001Q1	18,968	2.4%	51,413	3.6%	10,022	5.4%
2001Q2	32,168	6.2%	64,083	2.3%	10,129	4.4%
2001Q3	32,987	7.7%	70,688	3.5%	10,135	3.6%
2001Q4	25,519	4.8%	62,901	5.2%	10,226	3.2%
2002Q1	22,322	8.7%	54,446	6.3%	10,333	2.9%
2002Q2	34,430	5.9%	67,873	6.9%	10,427	2.9%
2002Q3	35,137	4.9%	74,219	6.0%	10,527	3.2%
2002Q4	29,619	10.8%	69,352	6.7%	10,591	3.4%
2003Q1	22,543	7.7%	62,534	8.7%	10,706	3.5%
2003Q2	33,688	5.0%	75,871	10.2%	10,832	3.7%
2003Q3	37,208	4.8%	86,856	13.6%	11,086	4.1%
2003Q4	26,479	-1.3%	85,316	16.8%	11,220	4.7%
2004Q1	26,150	1.5%	75,885	18.2%	11,406	5.4%
2004Q2	37,367	5.1%	96,171	22.1%	11,610	6.2%
2004Q3	43,311	8.3%	107,355	23.8%	11,779	6.5%
2004Q4	36,605	19.6%	98,148	21.6%	11,949	6.6%
2005Q1	31,404	20.4%	87,656	20.2%	12,154	6.6%
2005Q2	39,486	18.6%	108,970	16.8%	12,317	6.3%
2005Q3	50,492	18.5%	122,445	14.4%	12,559	6.4%
2005Q4	44,914	15.9%	114,439	14.8%	12,706	6.4%
2006Q1	35,199	14.4%	99,505	14.4%	12,965	6.4%
2006Q2	47,644	18.2%	113,527	11.9%	13,155	6.6%
2006Q3	53,261	14.6%	111,837	5.3%	13,267	6.4%
2006Q4	41,573	6.8%	91,128	-4.0%	13,392	6.1%
2007Q1	36,036	5.0%	71,731	-12.8%	13,552	5.6%
2007Q2	46,422	-0.5%	83,485	-20.4%	13,769	5.1%
2007Q3	46,649	-5.7%	83,469	-24.9%	13,971	5.0%
2007Q4	45,128	-1.9%	64,761	-27.1%	14,074	4.9%
Source:	U.S. Census Bureau		U.S. Census Bureau		Bureau of Economic Analysis	
Native Frequency:	Quarterly		Monthly		Quarterly	
Geography:	United States		United States		United States	