

Fastmarkets Repair & Remodeling Index

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This document provides a more detailed overview of the Fastmarkets Repair & Remodeling Index and contains five sections:

1. **Introduction**
2. **Review of existing repair and remodeling data**
3. **Index composition and methodology**
4. **Principal components analysis**
5. **Comparison to alternative measures**

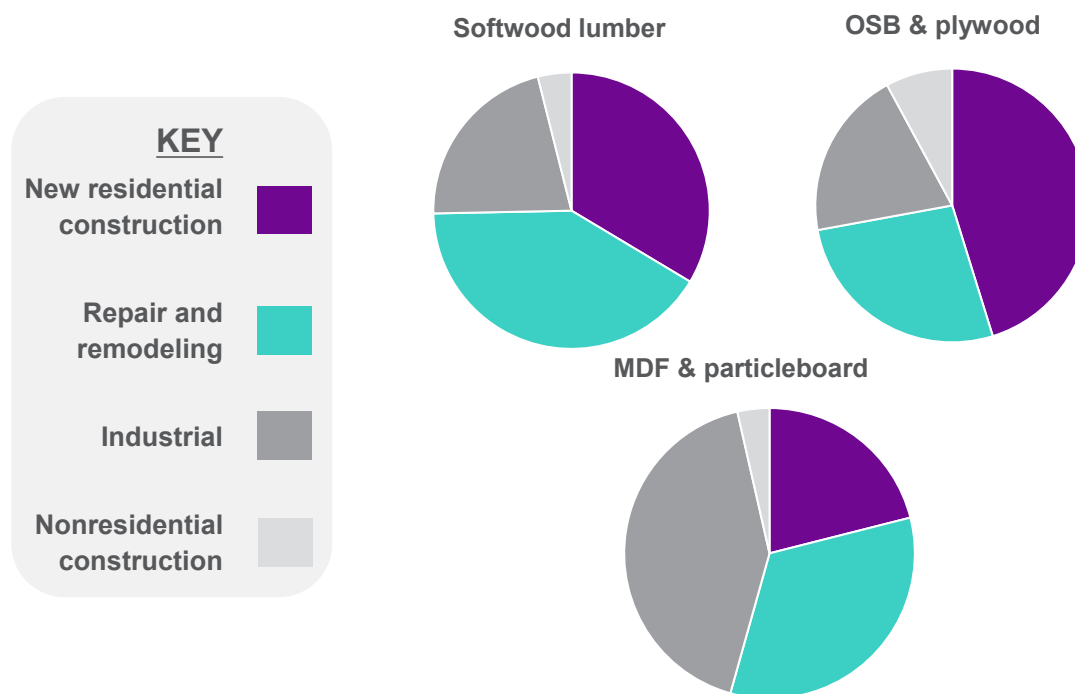
Introduction

Fastmarkets recently announced the launch of its new Repair & Remodeling Index (RRI) with the goal of providing a monthly indicator

of repair & remodeling (R&R) activity in the US, primarily as a gauge of wood products demand in that end-use market. One source of frustration in the industry can be the lack of timely, reliable data on R&R activity, especially given how crucial it is for wood products demand. Fastmarkets estimates that in 2022 R&R activity in the US accounted for 27% of domestic structural panel demand, 33% of domestic nonstructural panel demand and 41% of domestic lumber demand.

Also complicating the picture is that most measures of R&R activity track sales in dollars. Record levels of building material price inflation in recent years has made it more difficult to track underlying volumes of materials used in R&R. These circumstances ultimately motivated us to create a new monthly metric for tracking R&R activity in the United States.

Figure 1
 US wood product end-use market breakdown
 End-use share of total product volume in 2022



Source: Fastmarkets RISI.

The Fastmarkets RRI measures the “volume” of activity rather than spending. While this is a somewhat abstract concept since R&R as an umbrella category covers many different types of projects, the RRI can be conceptualized as a proxy for hours of repair and remodeling activity undertaken. The index is scaled so that the average value of the index in 2019 is 100. The RRI is composed of three variables which are weighted using principal components analysis (PCA). The three inputs to the RRI are inflation-adjusted retail sales at building materials dealers, hours worked by residential remodelers and Google Trends data on searches related to R&R activity. More detail can be found in the “Index composition and methodology” section.

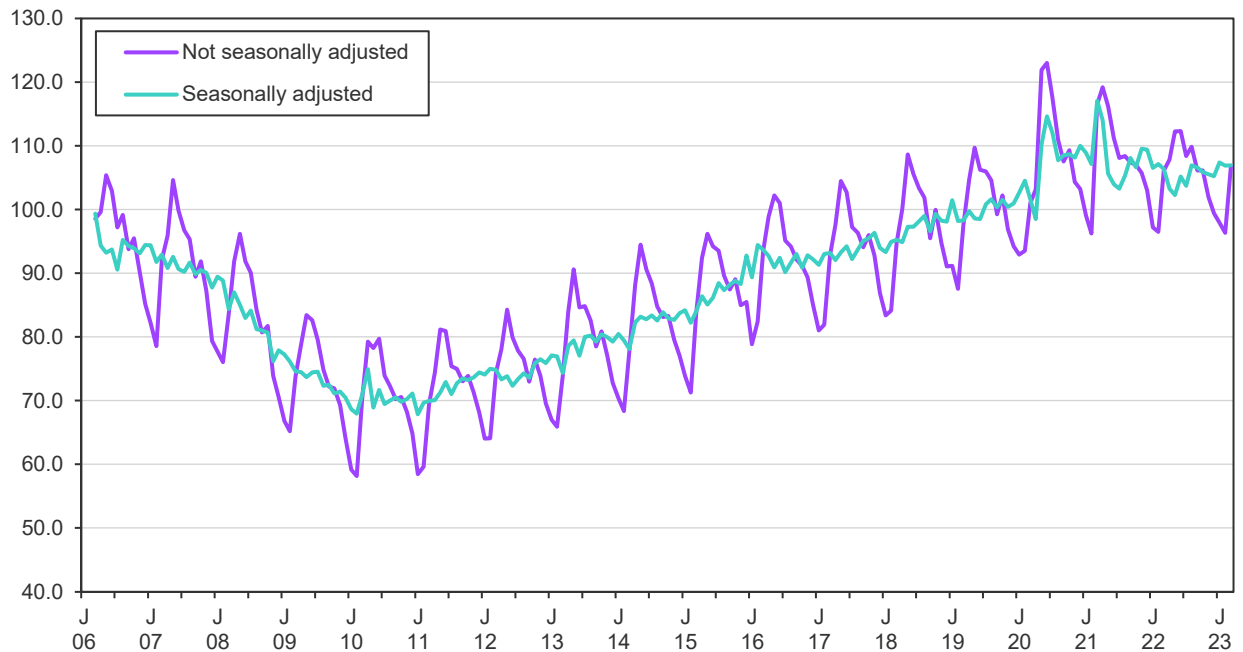
Repair and remodeling activity has a professional contractor (“pro”) side and a do-it-yourself (DIY) side. The Joint Center for Housing Studies of Harvard University (JCHS) estimates that the DIY share of repair and remodeling spending in 2021 was 19.9%.¹

However, the remaining 80.1% of expenditures include labor costs, while the DIY share does not. When adjusting for this, the DIY share of just building materials consumption in R&R is probably closer to 30% and cannot be ignored.

The retail sales data captures both professional (“pro”) activity and DIY renovation activity, on top of spending on new construction projects. Residential remodeler hours worked only captures the pro side of the market, and Google Trends likely more closely captures the DIY side as homeowners research their projects in advance. These three variables have different units and are transformed into like terms before constructing the RRI. This process is detailed in the “Principal components analysis” section.

The claim that Google Trends can be used to measure real economic activity can often draw skepticism, but there is research showing that Google Trends can be used to accurately predict real-world economic

Figure 2
Fastmarkets Repair & Remodeling Index (RRI)
Index level (2019 = 100.0)



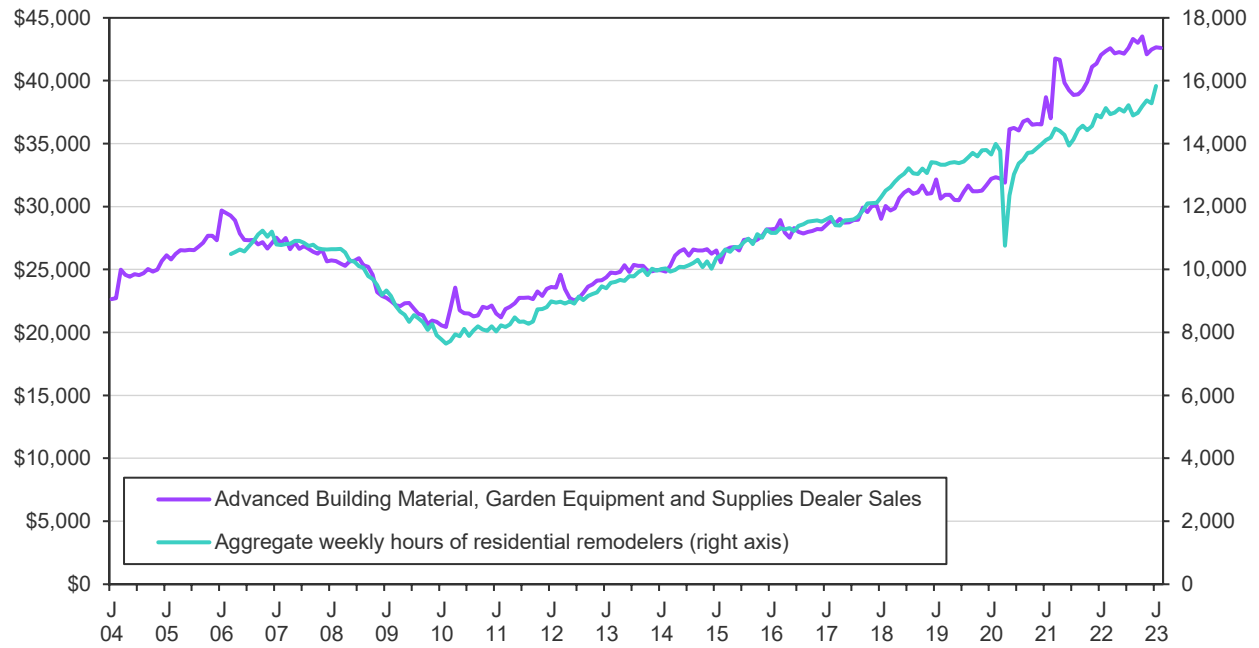
Source: Fastmarkets RISI.

¹ Joint Center for Housing Studies of Harvard University. (2023). *Improving America's Housing 2023*. Cambridge, MA. Retrieved from <https://www.jchs.harvard.edu/improving-americas-housing-2023>.

Figure 3

Building material sales and hours worked by residential remodelers

US dollars (millions, SAAR), aggregate weekly hours of all employees (thousands, seasonally adjusted)

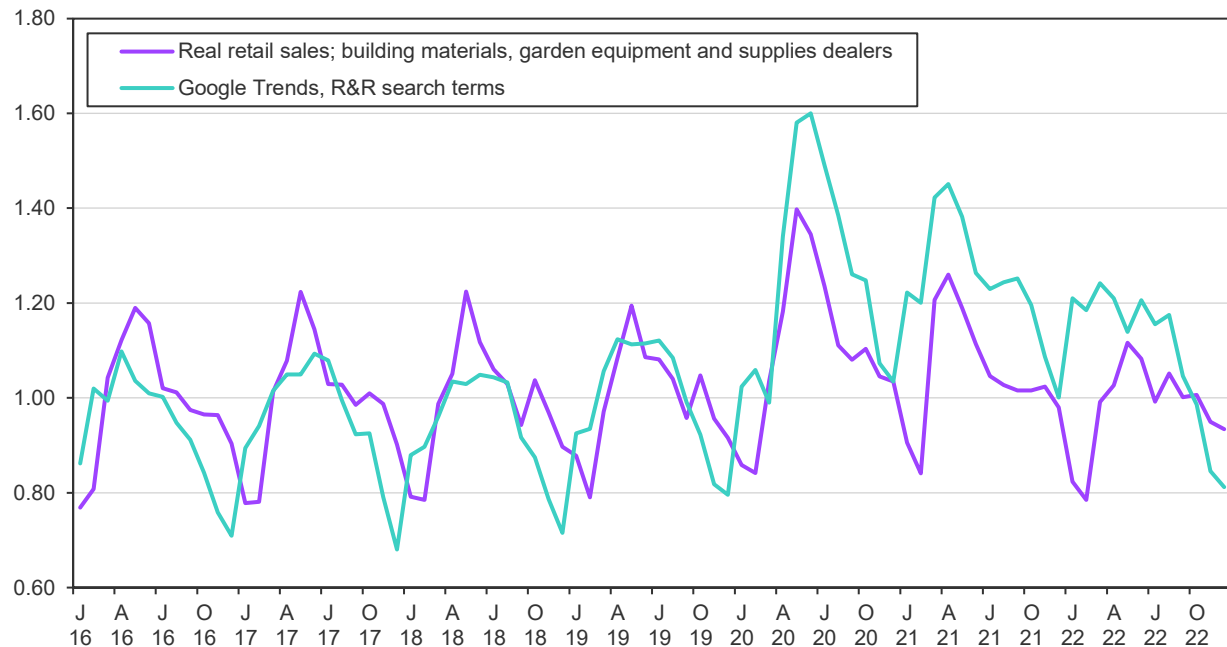


Source: US Census, BLS.

Figure 4

Real building material sales and Google searches

2019=1



Source: US Census, BLS, Google, Fastmarkets calculations.

Retail sales are deflated using a blend of PPIs reflecting building material costs, wholesaler margins and retailer margins.

activity, such as changes in the stock market,² economic re-openings after lockdowns³ and real-time changes to GDP.^{4,5} Google Trends data for the search terms we have selected is correlated strongly, but not perfectly, with inflation-adjusted building materials retail sales both seasonally and cyclically. This furthers the case that the data can be used in conjunction with hours worked by residential remodelers to generate an indicator for underlying R&R activity.

Review of existing R&R data

The building materials and wood product industry has been challenged to find a timely and accurate indicator to track US repair and remodeling activity. The industry represents a sizable share of total US construction activity and the broader economy, altogether accounting for over \$500 billion in annual spending.⁶ There is a plethora of detailed public data available to track new residential construction markets. This likely has the effect of anchoring too much analysis in the building material space on developments in the new construction market while ignoring what is happening in renovation and maintenance markets. In some cases, such as softwood lumber, R&R is actually a larger end-use market than single-family and multifamily construction combined. Tracking R&R activity in a timely and accurate way is essential to have a true handle on demand for building materials like wood products.

The most frequently followed data to analyze the R&R market comes from two main sources: the **C-30 improvements data** reported by the US Census Bureau and the Joint Center for Housing Studies of Harvard University Leading Indicator of Remodeling Activity (LIRA).

C-30

According to the US Census Bureau, improvements spending accounted for 20-30% of private residential construction spending prior to the 2008/09 global financial crisis and 30-50% since. The C-30's biggest advantage is that it is reportedly monthly in a relatively timely manner.

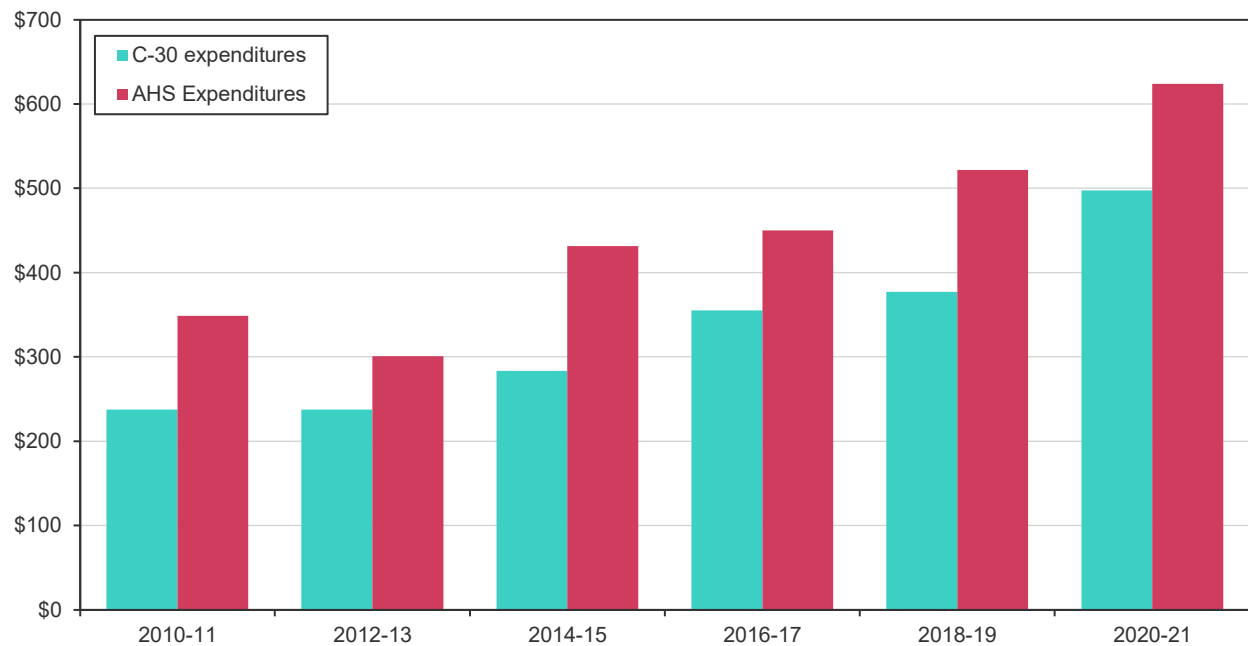
However, as the Harvard Joint Center for Housing Studies (JCHS) lays out in detail, the C-30 improvements data are notorious for being highly volatile month to month and subject to major annual revisions which can entirely change the trajectory of the series.⁷ Part of the challenges with the C-30 data relate to sample size, survey design and forecasted components of the estimates. We would strongly encourage those interested in the subject to look through the JCHS literature.

It is also important to note that the C-30 data only tracks “improvements” and not home maintenance that addresses the regular wear and tear over the life of a home. Basic and unplanned maintenance is a significant source of R&R demand. On top of the narrow measure of R&R, the JCHS has pointed out that the C-30's estimation of the improvement expenditures tracked materially underestimates the true size of the improvement side of the market in the US, with American Housing Survey (AHS) estimates of improvement spending exceeding those in the C-30 by about 50%.⁸ This pattern has continued in recent years, though the differential fell to 25% in 2020-21 (Figure 5). This may be due to the fact that the census C-30 data on improvements is based on data from the Consumer Expenditure Survey, a survey designed for the creation of the Consumer Price Index (CPI), while the AHS was designed

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- 2 Preis, T., Moat, H. S., & Stanley, H. E. (2013). Quantifying Trading Behavior in Financial Markets Using Google Trends. *Scientific Reports*, 3, 1-6.
 - 3 Austin, P., Marini, M., Sanchez, A., Simpson-Bell, C., & Tebrake, J. (2021). *Using the Google Places API and Google Trends Data to Develop High Frequency Indicators of Economic Activity*. IMF.
 - 4 Austin, et al. (2021).
 - 5 Bantis, E., Clements, M. P., & Urquhart, A. (2022). Forecasting GDP growth rates in the United States and Brazil using Google Trends. *International Journal of Forecasting*.
 - 6 Joint Center for Housing Studies of Harvard University. (2023).
 - 7 Will, A. (2016). *Re-Benchmarking the Leading Indicator of Remodeling Activity*. Research Note, Harvard University, Joint Center for Housing Studies, Cambridge, MA. Retrieved from Joint Center for Housing Studies of Harvard University: https://www.jchs.harvard.edu/sites/default/files/Iti-file/n16-4_will_0.pdf.
 - 8 Will, A. (2016). *Re-Benchmarking the Leading Indicator of Remodeling Activity*.

Figure 5**Homeowner improvements spending**

Two-year totals, billions of dollars



Source: US Census Bureau.

to collect housing information specifically.⁹ The AHS is more comprehensive, but it is only released every two years, making it impractical for any real-time tracking of R&R activity.

It should also be highlighted that the C-30 data in 2021-22 shows phenomenal growth in residential improvements that, while plausible, becomes hard to square when considering the implied “volume” of activity during those years if we control for building material inflation and labor costs. Other factors such as changing project composition or contractor margins could account for the big discrepancy, but we find it very hard to believe implied volumes of residential improvements increased at a double-digit pace in 2022 when structural wood products demand fell and prices for those associated products collapsed.

The C-30 data also seems rather inconsistent with total building material sales. While the two measure different things – with retail sales being far broader and capturing new construction as well – the volatility in

the C-30 data appears quite unusual, and the overshoot in 2022 is especially striking and hard to reconcile. Part of this certainly reflects drags from the new construction side affecting retail sales of building materials. But even when looking at alternative measures of activity in the market, such as retail sales from Home Depot and Lowe’s, the C-30 improvements numbers are challenging to reconcile. The body of evidence points to the C-30 improvements data being at the very least a problematic data set for tracking real time R&R activity, despite having the redeeming quality of being reported monthly.

LIRA and JCHS R&R benchmark

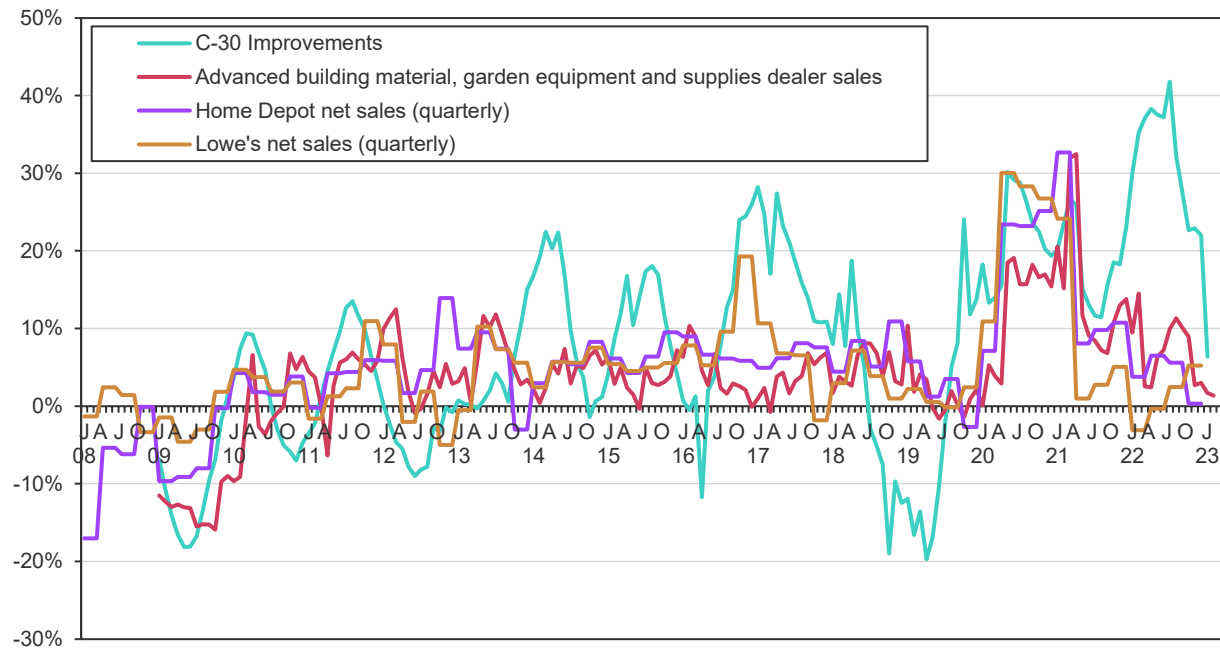
The JCHS clearly has a more robust methodology for tracking R&R spending and should be the benchmark for understanding the size and growth of R&R sales in the US. Every two years, the JCHS estimates the size of the total R&R market in the US based on data from a number of sources including the American Housing Survey (AHS), which is

⁹ United States Census Bureau. (2022). *Construction Methodology*. Retrieved from census.gov: <https://www.census.gov/construction/c30/methodology.html>.

Figure 6

C-30 Improvements vs building material sales and home improvements net sales

Percentage change, year over year



Source: US Census, Home Depot and Lowes earnings releases.

released biennially. The JCHS recently released its latest *Improving America's Housing report* in March, and we would encourage readers to read through the report given the wealth of information it contains on the remodeling market. The biennial *Improving America's Housing report* also includes spending estimates for rental properties, unlike the flagship LIRA indicator. While this is the most comprehensive and detailed publicly available data on R&R activity in the US, a two-year lag for receiving an accurate estimate of the R&R market is a clear limitation of the data for those trying to track the market in real time.

The JCHS has partially addressed this by building its own model, the LIRA, to provide a timelier estimate of the R&R activity. The LIRA was originally created to smooth out the volatility in the Survey of Residential Alterations and Repairs data, also known as the C-50 data, but this survey was discontinued shortly after the LIRA was created.¹⁰ This C-50 Census

data was subsequently replaced by the Monthly Construction Spending or C-30 data in 2008, which meant that the benchmarking series no longer included expenditures on maintenance and repairs and spending on rental properties.¹¹ Since then, the JCHS has periodically rebenchmarked the LIRA using the AHS, which reintroduced repair and maintenance expenditures into the equation, but not rental property spending.¹² Much like the index Fastmarkets has developed, the LIRA is not a direct measure of R&R activity stemming from a survey of households, retailers or contractors. Instead, it is modeled based on variables with historically high correlations with measured remodeling activity. The JCHS continues to benchmark its LIRA model every two years with its comprehensive historical update that coincides with the release of the AHS.

To its credit, the JCHS is very transparent about its approach, and lays out the list of variables and respective weights on its website

10 Will, A. (2008). *Addendum to Research Note N07-1: Re-Benchmarking the Leading Indicator of Remodeling Activity*. Research Note, Harvard University, Joint Center for Housing Studies, Cambridge, MA. Retrieved from https://www.jchs.harvard.edu/sites/default/files/lri-file/n08-1_will_0.pdf

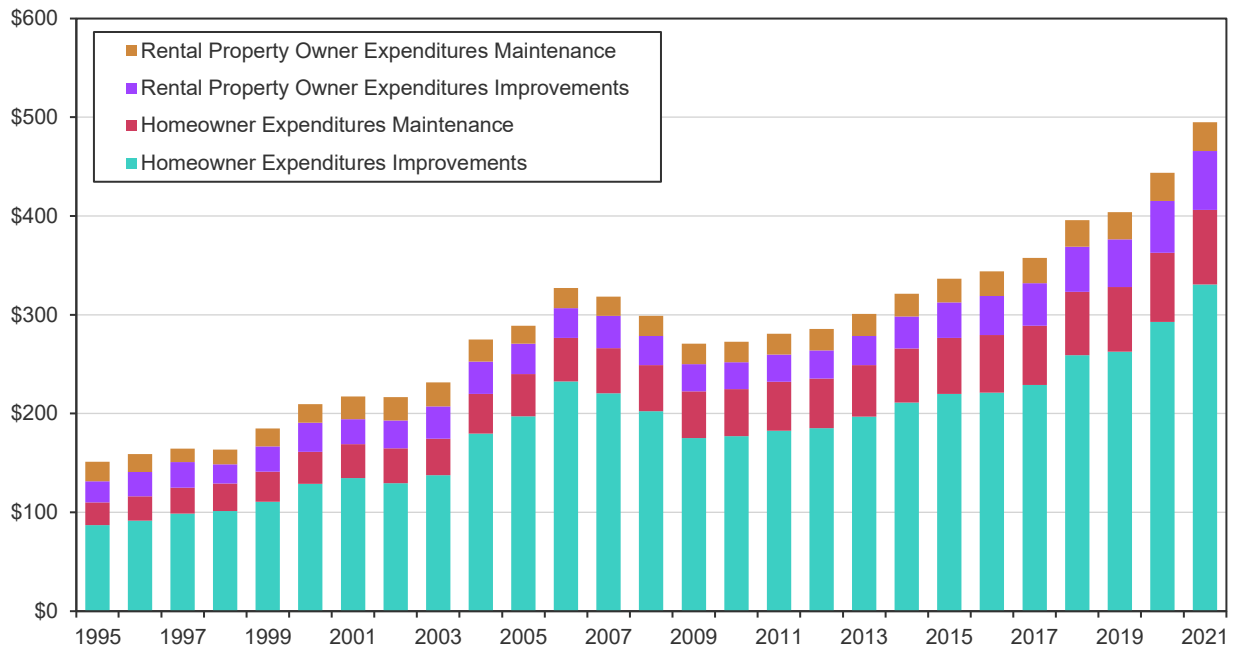
11 Will, A. (2008). *Addendum to Research Note N07-1*.

12 Will, A. (2016). *Re-Benchmarking the Leading Indicator of Remodeling Activity*.

Figure 7

Improvement and maintenance expenditures to owner and rental housing stock

Billions of dollars

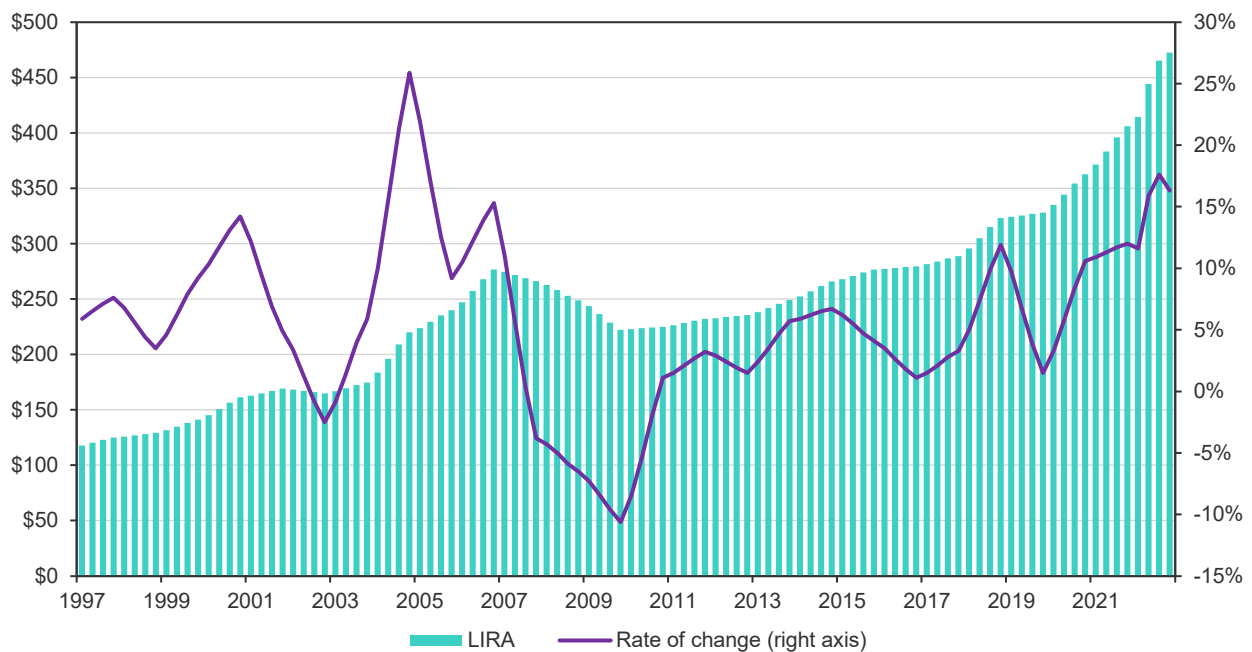


Source: Harvard Joint Center for Housing Studies.

Figure 8

Leading Indicator of Remodeling Activity (LIRA)

Billions of dollars (four-quarter moving total), rate of change



Source: Harvard Joint Center for Housing Studies.

and updates this quite frequently along with its **biennial benchmark process**. However, like any model, the LIRA faces its own limitations.

The LIRA is only calculated as a four-quarter rolling total, which makes for a cumbersome measure to interpret R&R demand in real time. Also, as mentioned above, the LIRA only represents improvements and maintenance expenditures in owner-occupied homes. The JCHS identifies rental property expenditures as 18-19% of total R&R spending in recent years.

Like all sales- and dollar-measured data, inflation also complicates interpretations of the LIRA. For many users, this is not a major limitation as dollar sales are the primary measure they care about for sizing the market. However, in the building materials and wood products space, where tracking commodity volumes in a timely fashion is also critical, dollar sales can mask underlying market trends in a highly inflationary environment. Prior to the pandemic, building materials and labor inflation were fairly tame and consistent year to year, so it was not a big impediment to understanding underlying volume trends in the R&R market. Deflating the LIRA by the Consumer Price Index (CPI) to get “real” R&R spending was a reasonable proxy for underlying volume of R&R activity. However, since 2020, building material inflation has exploded, making the underlying activity represented by the LIRA much more challenging to decipher. Simply using the CPI to deflate the LIRA would be misleading when building materials inflation is volatile, for example when it peaked at over 50% year-over-year growth during the summer of 2021. This is in addition to the fact that the LIRA had challenges capturing the R&R boom in 2020 and 2021 prior to the biennial rebenchmarking process undertaken by the JCHS earlier this year. More details on this revision and its implications for the RRI can be found in the “Comparison to alternative measures” section.

Index composition and methodology

This section contains more detail on the three variables that comprise the index, including the monthly update procedures and considerations for revisions. To ensure a robust and consistent methodology, we have

described the key processes and deadlines for how and when the RRI will be updated. The process has the potential to be tweaked over time as we refine this new index, but the following is how we will proceed with updating the index until further notice.

Release date and publications

The Fastmarkets RRI will be released each month five business days after **housing starts are published by the US Census**, coinciding with the Fastmarkets release calendar for the *Lumber Commentary*, the *Structural Panel Commentary* and *Particleboard and MDF Commentary*. The data will be reported in all three commentary publications with history going back to March 2006 available to subscribers. The RRI will also appear in *Random Lengths Weekly* the Friday following the release with our commentary publications, but in truncated form (12-18 months of history reported on a rolling basis).

Data sources and estimation techniques

Fastmarkets uses three main variables to calculate the RRI. The first is retail sales at building materials, garden equipment and supplies dealers, adjusted for inflation. The second is aggregate weekly hours worked for professional residential remodelers. The final piece is Google Trends search data for terms related to home improvement and renovation.

Inflation adjusted retail sales

The RRI uses retail sales data from the building materials and garden supply stores included in the Advance Monthly Retail Trade Survey from the US Census, which is **released near the middle of each month**. As of this writing, each announced future release will occur prior to the monthly housing starts release. To adjust the retail sales data for inflation, Fastmarkets also uses a blend of producer price indices (PPIs) factoring in building material costs in residential maintenance and improvements along with wholesale and retail margins in that sector. **The PPIs are released by the BLS** prior to the advance retail sales estimates each month.

Once released, the inflation adjusted building material sales index is calculated. There are

several revisions in the underlying data that will flow into revised estimates of the RRI. Advance retail sales estimates are subject to revisions as full survey responses and late responses from survey participants trickle in. Monthly retail sales data is also revised annually to square the data with the Annual Retail Trade surveys, which can affect reported data going back several years. The most recent revision reduced retail sales 0.2% in 2018 and raised it 0.9% in 2022, with intermediate changes applied to the years between. At the same time, PPIs are typically revised for up to three months following their initial release and are also subject to more comprehensive revisions on occasion. We will include all short-term and comprehensive revisions in either retail sales or PPIs into the RRI index as they occur.

Remodeler hours worked

Aggregate weekly hours worked for detailed industry categories are reported in the **supplemental tables** to the Employment Situation release from the BLS each month. Aggregate weekly hours are equal to average weekly hours times number of employees and does not appear directly in any of the supplemental tables, though the data series is available in the Employment Situation report in indexed form. Each month, the average hours worked, payroll size and aggregate hours worked are available for the two-digit NAICS categories, i.e., construction, for the most recent full month. More detailed sub-sector data — in our case residential remodelers — is available with a one-month delay. For example, the April release would include an estimate of aggregate hours worked in the broader construction category for March but the latest available data point for remodeling contractor hours worked would be for February.

To deal with this, Fastmarkets estimates the most recent historical data point using the rolling trend in aggregate hours worked in all construction compared with remodeler hours worked to estimate the most recent remodeler hours data. In the following month, our estimate of residential remodeler hours worked would be replaced with the reported value. We may alter this approach in the future

if we find a superior method, but at present it predicts reported hours reasonably well.

Note that the baseline BLS data for aggregate hours worked is typically revised back for up to two months after the initial Employment Situation data release as the BLS incorporates data that was unknown or missing at the time of the initial release. This is in addition to our estimated value for the most recent month being replaced by the now available remodeler hours worked. The BLS also incorporates a **comprehensive revision** annually after each year is complete using employment insurance records, which are a more complete sample than survey results. As with retail sales, Fastmarkets will incorporate both immediate and comprehensive revisions in the underlying data into the RRI as they appear from the BLS.

Google Trends

Finally, the Google Trends data is also collected by Fastmarkets to create the third subindex used in the headline RRI. There are a handful of data management practices necessary to turn Google Trends data into a usable format.

Google Trends data are available going back to January 2004 and are always in relative terms scaled between 0 and 100. In order to create a consistent Google Trends index — not to be confused with the final RRI, in which the Google Trends index is one of three key variables — we aggregate a group of specific search terms related to DIY R&R activity. There are a few necessary steps to clean this data before it can be used. Predominant among these is the fact that Google made improvements in the data collection process in 2016 and 2022, so there are breaks in the data. Some economists have addressed this by assuming an annual growth rate of 0% in the January of each year with a break in the data.¹³ We instead use a modeled growth rate for each individual search term prior to aggregating them into a single Google Trends index variable.

Google Trends data downloads use a representative sample of all searches, so downloads on different days will have slight variations in the data. These variations are minimal and, in our case, cancel out a majority

13 Woloszko, N. (2020, Dec). *Tracking activity in real time with Google Trends*. OECD Economics Department Working Papers. Paris: OECD Publishing. Retrieved from OECD iLibrary: <https://doi.org/10.1787/6b9c7518-en>.

of the time since we are using an aggregation of many different search terms. Nevertheless, there are minor variations in the data because of this. After each full year, we will replace the Google Trends component of the RRI in the year prior with the average of the data from the 12 monthly downloads. We have already averaged the history through the end of 2022, so the first time this adjustment will occur is at the end of 2024 and it will apply to 2023 data. At the end of 2024, there will only have been one download of December 2024 data, so we wait until we have multiple data downloads to average. We download the data each month on the release date of the *Advance Monthly Retail Trade Report*. We will use the monthly data for the two most recent complete months until they are replaced by the average of the data from 12 separate monthly downloads. Again, the effect of this revision process is almost imperceptible, and the use of averages is simply to remove noise from the data.

Seasonal adjustment process

Fastmarkets pulls all the underlying data to create the subindices and headline RRI index in non-seasonally adjusted (NSA) form so as to capture demand variation of repair and remodeling volumes month to month. This is a core feature of why we embarked on creating the index to get a better gauge of underlying wood products demand for the R&R market. Interpreting seasonally adjusted data is much more intuitive, so the RRI is also reported in this form. Fastmarkets utilizes the X-13ARIMA-SEATS seasonal adjustment process, which is used broadly to seasonal adjust many reported private and publicly available datasets. The methodology is elaborated upon in great detail in a [publication by the US Census Bureau](#).

Fastmarkets will recalculate its seasonal adjustment factors on an annual basis in February before its normal monthly release of the RRI and include these revisions in a comprehensive historical revision to the RRI. Between each year's seasonal adjustment update, seasonal adjustment factors from the prior year will be utilized to calculate the current year's seasonal adjustment data.

Summary of data sources and estimation techniques

Residential remodeler hours worked along with building materials retail sales data and the PPIs we use to deflate them are all subject to several months of revisions after being initially released. These revisions are normally quite small. We estimate the value of residential remodeler hours in the most recent month until the following month when it is replaced with the reported value from the BLS. Each of these underlying variables are also subject to annual revisions, while the Google Trends data are merely averaged after several data downloads at different times. All revisions to remodeler hours, retail sales and PPIs are immediately incorporated in the index. We average Google Trends data and recalculate seasonal factors once a year coinciding with the BLS' annual revisions to minimize the frequency of these longer-term revisions.

Principal components analysis

Principal components analysis (PCA) is a procedure by which a large number of variables can be reduced to a smaller number. This can be useful as a preliminary step in regression estimations to the number of independent variables while retaining the information contained by them.¹⁴ It can also be used to create an index capturing something not directly or easily measurable or merely lacking direct data, which is the purpose for which we have employed it here.

The mathematical process itself is fairly complicated, but most academic studies using the process give a brief explanation of how it works in a methods section, some with illustrations of the concept to aid in understanding.¹⁵ In short, PCA forms new variables from linear combinations of the original variables along different dimensions.¹⁶ The dimensions are perpendicular to each other, with the dimensions being ordered according to the degree of variation in the original variables they capture. The first principal component captures the most

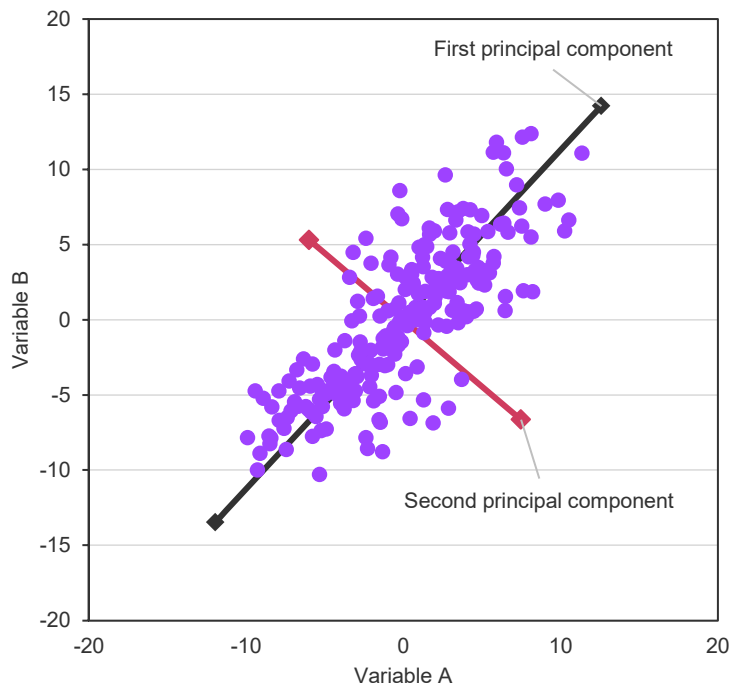
14 Stock, J. H., & Watson, M. D. (2002). Forecasting Using Principal Components From a Large Number of Predictors. *Journal of the American Statistical Association*, 1167-1179.

15 Vyas, S., & Kumaranayake, L. (2006). Constructing socio-economic status indices: how to use principal components analysis. *Health Policy Plan*, 459-68. doi:10.1093/heapol/czl029.

16 Vyas & Kumaranayake (2006).

Figure 9
Principal components analysis

Example data

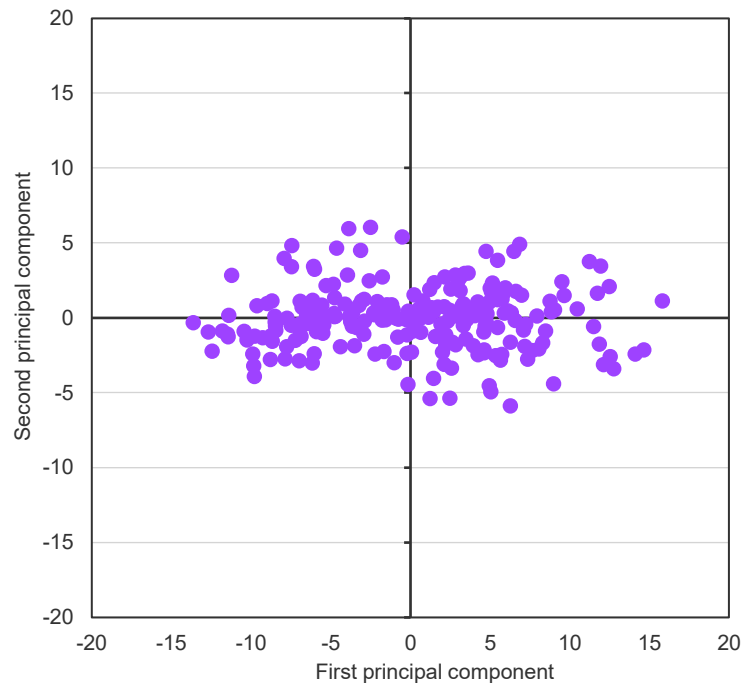


amount of information, the second less so and so on down to the last. Using PCA with only three variables will return up to three principal components, and for index creation we only use the first principal component. Figures 9 and 10 illustrate the process by showing the difference between a set of example data plotted in terms of any two variables A and B and in terms of the two principal components of the data.

In our case, the first principal component captures approximately 75% of the variation in our three chosen variables. In theory, this means that 75% of the variation among the three variables we use in calculating the RRI is due to the change in underlying R&R activity. All three variables are positively correlated with the first principal component. This matches the intuition: the three variables we have selected are all positively related to R&R activity. The second and third principal components, which capture the remaining variation that is not captured by the first, have mixed signs. The interpretation of this is that

Figure 10
Principal components analysis

Example data (transformed)



they are either indicating something other than R&R activity or are merely statistical noise.

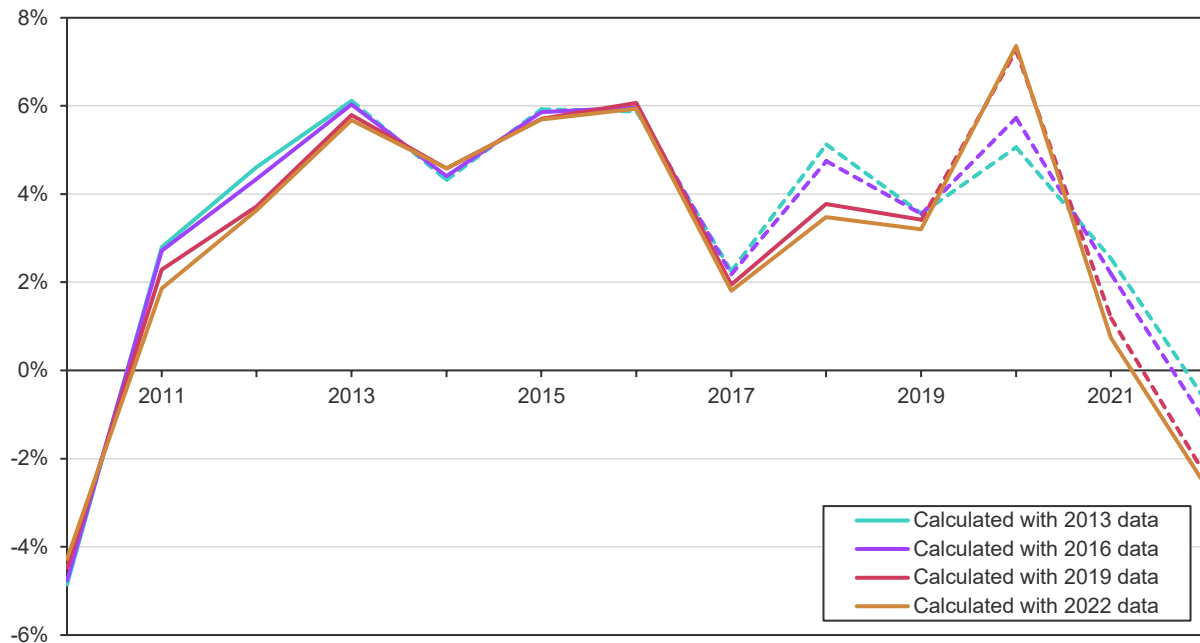
The final step in calculating the RRI is simply to create a linear combination of the three underlying variables along the first principal component, with coefficients or weights determined by the PCA process.

Once annually we will re-estimate the PCA and recalculate the RRI over the entire history. This annual re-estimation of the PCA increases the accuracy of the weighting of the three variables with an increased sample size. This ensures the weights of the variables do not become skewed over time. Figure 11 shows a simulation of what the annual growth rates in the RRI would look like after this re-estimation process using data available at the end of 2013, 2016, 2019 and 2022. Simulated RRI revisions in the other years are omitted for clarity, and their corresponding growth rates are in between those calculated in the years before and after them.

Figure 11

Fastmarkets Repair & Remodeling Index

Annual percent change



Source: Fastmarkets calculations.

Comparison to alternative measures

With the development of any type of index to track market activity, trying to benchmark performance and accuracy is always going to be a key question for users. However, part of the reason we have created the Fastmarkets RRI is that there is no other source of publicly reported data capturing R&R volumes, making it unique. In theory, our methodological approach is likely capturing underlying R&R activity by using statistical principles to compare highly correlated indices or proxies for volume, but without a “gold standard” benchmark, it makes it difficult to back-test the series.

However, it is still useful to compare our newly developed index against the other data that is available and more familiar to the industry. The biggest factor to control for when comparing the RRI to dollar-value measures, as discussed earlier, is inflation. There are no established deflators for the C-30 data or the LIRA, but we can make some reasonable assumptions to

transform these nominal dollar figures into real terms. While this will not create perfect apples-to-apples comparisons, longer-term trends should roughly align, and we can also assess if the RRI is better at capturing key “turning points” in the R&R market in a more timely manner.

RRI vs C-30

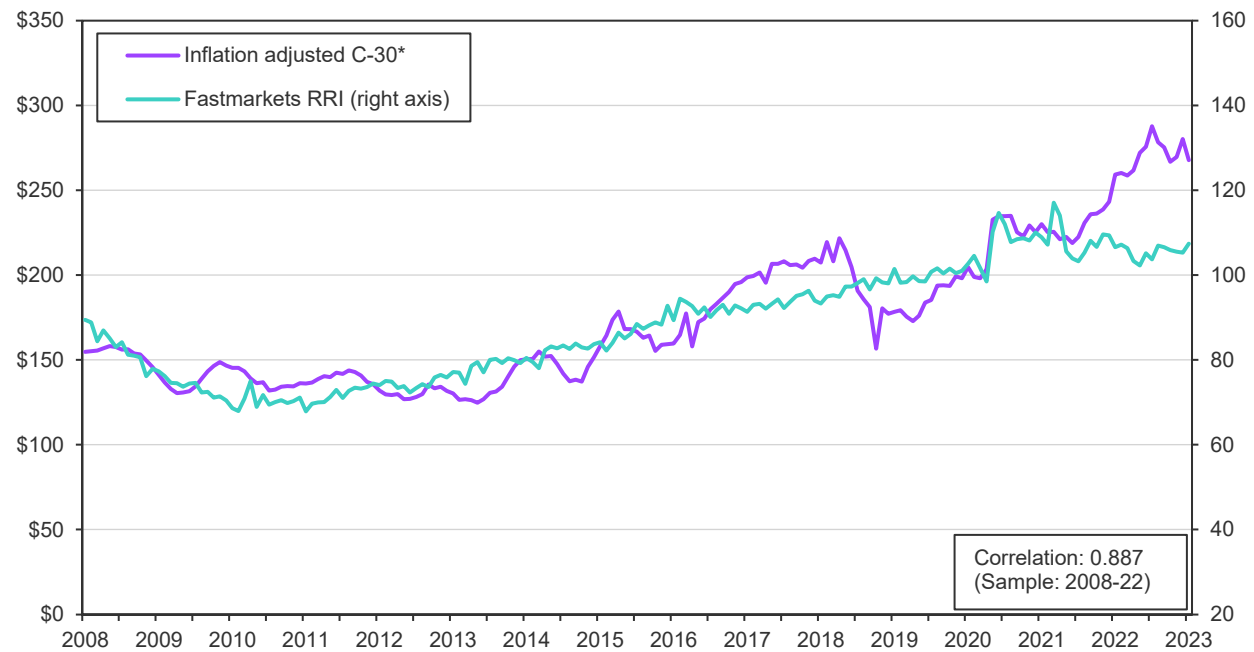
As we elaborated in the “Review of existing R&R data” section, there are a number of reasons to be skeptical of the Census C-30 data as an accurate indicator the repair and remodeling market. Nevertheless, for the sake of due diligence, it is still worth comparing the RRI to inflation-adjusted C-30 data.

To deflate the C-30 data, we have assumed a blend of the PPI for building materials and average hourly earnings (AHE) of construction labor at a 66/34 split. There is no correct answer to properly deflating the data, given that the relative weights of material costs and labor will vary over time and the difficulty in estimating the breakout, but for now, this is our chosen

Figure 12

Inflation adjusted C-30 and the Fastmarkets Repair & Remodeling Index

Billion 2019 US dollars (SAAR), index level (2019 = 100)



Source: US Census, BLS, Fastmarkets calculations.

* C-30 inflation adjusted assuming two-thirds building material inflation and one-third labor.

approach based on our own research. The BEA takes a similar approach when deflating residential improvements data as **documented in the NIPA handbook**.¹⁷

How do the monthly seasonally adjusted series compare? Overall, the C-30 adjusted for inflation and the RRI have a correlation of 0.887 over the 15 years of history available for comparison. The results show that both series loosely trend together from 2008 to around 2018 but have some noticeable differences beyond 2018. The drop in inflation-adjusted C-30 improvements in 2019 is particularly striking, but even more noteworthy is the divergence in activity from 2022 onward. We suspect that the C-30 figures will see substantial downward revisions when all is said and done, but it is possible that the delta in trend just reflects fundamentally different things being measured in each, namely that the C-30 adjusted for inflation excludes residential maintenance.

RRI vs LIRA

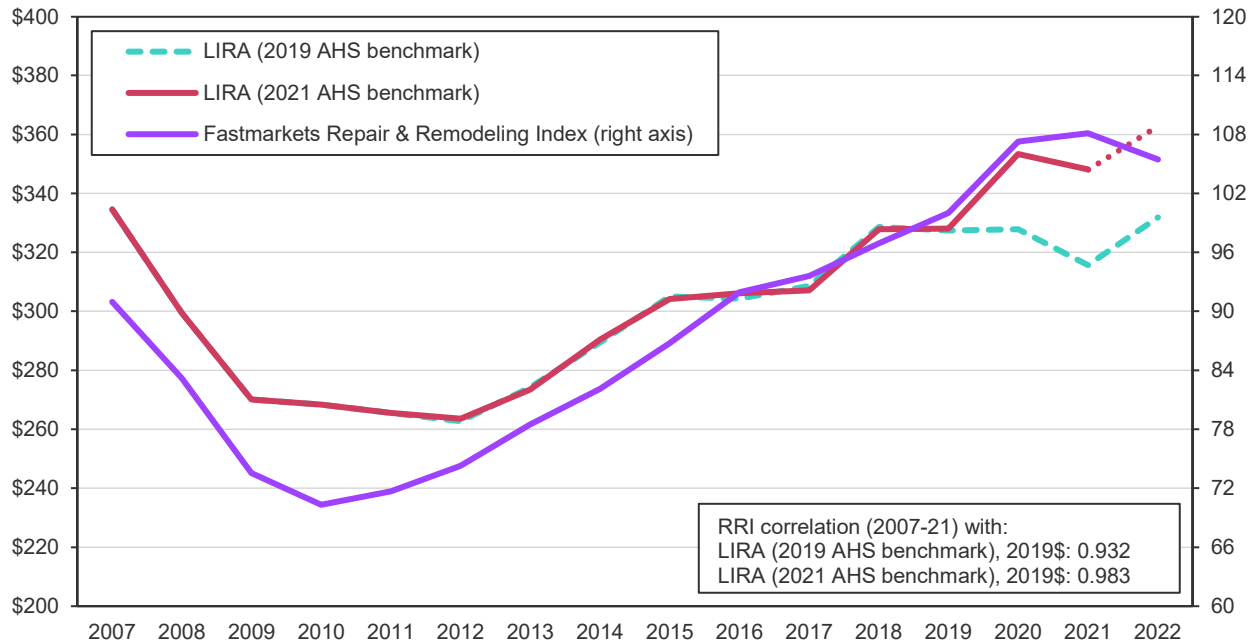
We believe the JCHS data is probably the more robust data set to compare against given the comprehensive assessment of the R&R market size the JCHS goes through every two years. The main problem here is the LIRA is largely annual data, while our RRI is a monthly index. Still, if we annualize the RRI and compare against the LIRA adjusted for inflation — using the same 66/34 materials vs labor costs split used for the C-30 — we can see that the LIRA based on the latest 2021 benchmark and RRI growth profile year to year roughly align with one another.

Probably more crucially, though, the JCHS has recently revised the last two full years of its LIRA time series (2020 and 2021) based on the latest biennial benchmark against the American Housing Survey. Interestingly, the revisions were substantial and to the upside, even prompting the **JCHS**

17 U.S. Bureau of Economic Analysis (BEA). (2022, December). *NIPA Handbook, Chapter 6: Private Fixed investment*. Retrieved from Bureau of Economic Analysis: <https://www.bea.gov/resources/methodologies/nipa-handbook/pdf/chapter-06.pdf>.

Figure 13
Fastmarkets Repair & Remodeling Index and LIRA (before and after latest benchmark update)

Billions of 2019 dollars, index (2019 = 100)



Source: Harvard Joint Center for Housing Studies, Fastmarkets calculations.

Note: LIRA data has been inflation adjusted assuming that two-thirds of reported R&R spending is accounted for by building materials and the remaining third is labor costs.

to offer an explanation in a special note to those following the index closely. The pandemic had a series of cascading effects in the economy that broke the relationships between variables which had historically been closely correlated. Through no fault of the JCHS, the LIRA had not captured the R&R activity boom in 2020 until this re-benchmarking. The most encouraging detail to us at Fastmarkets was that the revisions brought the LIRA’s implied volume growth much closer to the growth rates suggested by our Fastmarkets R&R Index.

Year to year, we definitely see notable variations, but the overall trend growth profiles remain similar. From 2007-21, the average difference in the annual growth rates between the updated LIRA and the RRI is just 0.9%, and the difference falls to 0.4% if 2012 and 2016 are excluded. In 2012, increases in contractor hours and real retail sales led to an increase in the RRI of 3.6% in that year

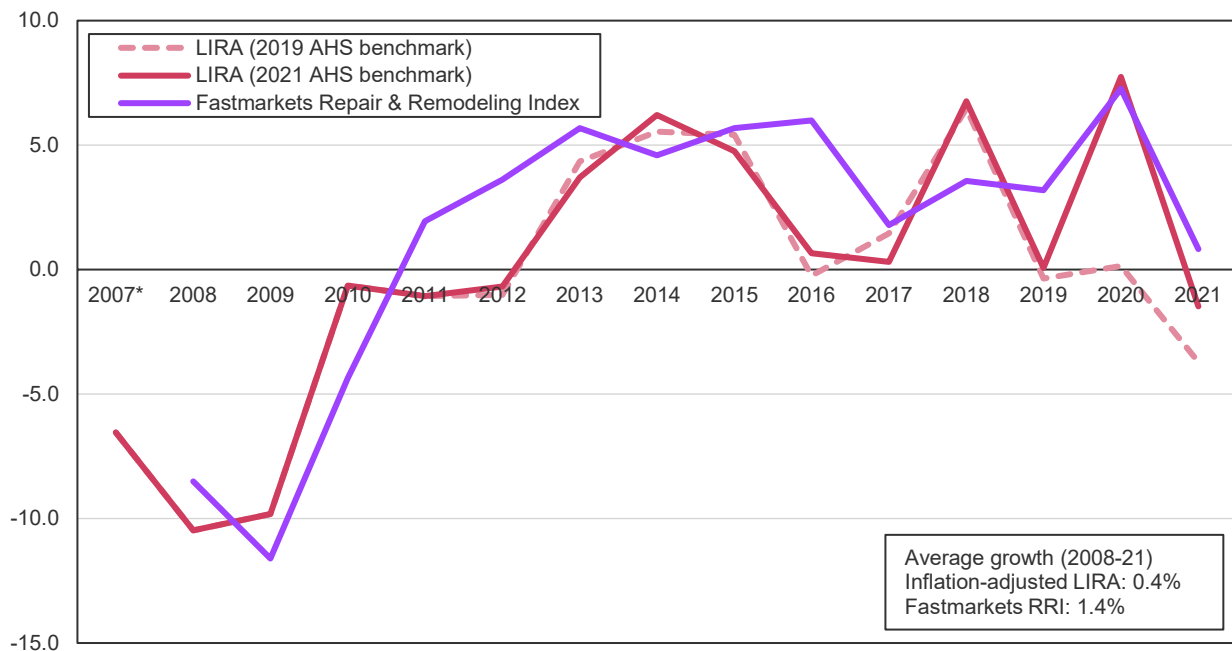
compared to a reduction in R&R spending in real terms of 0.7% according to the LIRA. In 2016, similarly, all three variables comprising the RRI show growth of 5% or more, while the LIRA shows growth of 0.7% in real terms.

The LIRA and the RRI measure slightly different things, and the assumptions we have made to deflate the LIRA for this comparison are ultimately just assumptions. Without expecting the two metrics to show the same percentage growth in every single year, the RRI is still a useful indicator of where R&R demand is headed, especially considering that it is available on a monthly basis. While the LIRA could potentially have superior accuracy once its finally benchmarked, it ultimately takes up to two years for that fully benchmarked data to be incorporated into the LIRA model. The LIRA excludes R&R activity in rental properties, which is another reason one should expect some difference in the implied volume of R&R given by the two metrics.

Figure 14

Fastmarkets Repair & Remodeling Index and LIRA (before and after latest benchmark update)

Annual percentage change



Source: Harvard Joint Center for Housing Studies, Fastmarkets calculations.

Note: LIRA data has been adjusted for inflation assuming that two-thirds of reported R&R spending is accounted for by building materials and the remaining third is labor costs.

* RRI growth rate in 2007 omitted due to the lack of a full year of data in 2006.

RRI vs annual JCHS total remodeling market spending

As one can probably gather from reading through this report thus far, we hold the JCHS data in very high regard and suspect that the center’s broader remodeling market spending estimates – which include rental property spending – released with the *Improving America’s Housing* reports are the best estimates currently available for sizing the R&R market. Obviously, the limitation here is that the data is only available annually and subject to a significant lag. Still, it is likely the most comprehensive source of R&R data that is publicly available.

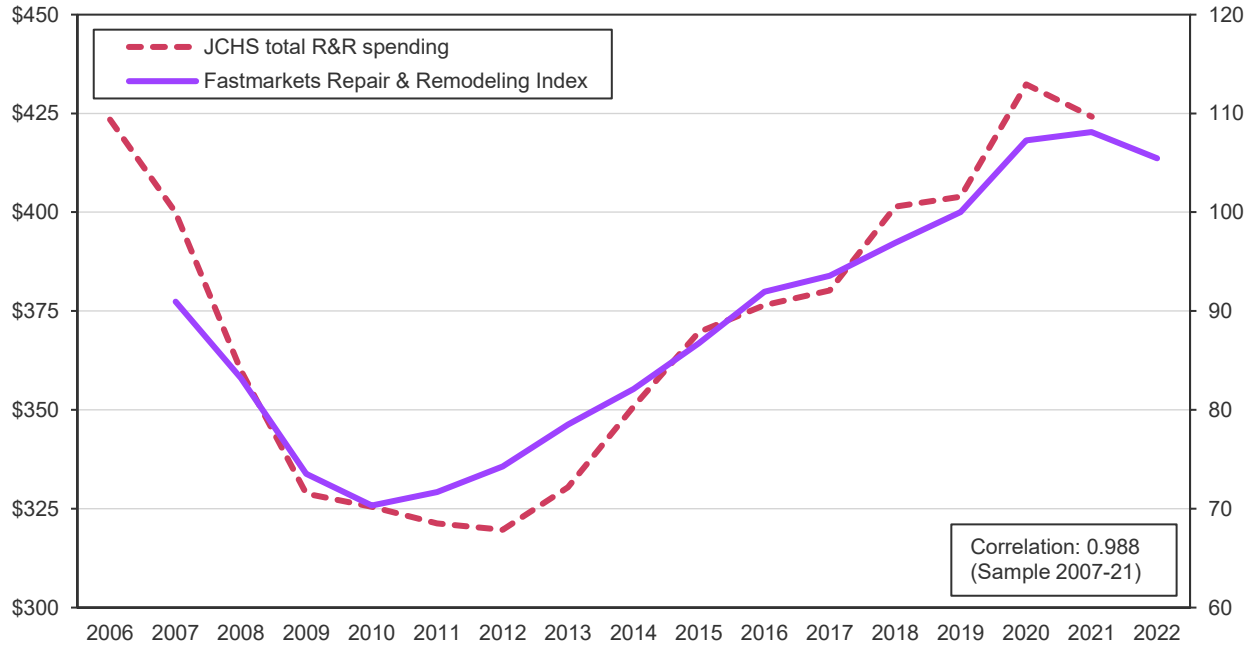
Similar to the previous comparisons with the LIRA and the C-30 data, inflation adjusting the JCHS total R&R spending is a rather tricky task, but for the sake of simplicity, we are once again assuming a 66/34 split of building materials inflation

and construction labor costs to deflate the annual benchmark to real US dollars.

The RRI and the JCHS overall R&R market broadly follow the same pattern from 2007-21, with a correlation of 0.988 (Figure 15). The growth profile also shows the RRI and JCHS total R&R market broadly tracking each other reasonably well, although there is a fair amount of variation from year to year (Figure 16). Both calculated indices capture a big shift in R&R activity from 2007-09, a higher rate of growth in 2013-15 and somewhat of a downshift from 2017-19. Finally, the big surge in 2020 and subsequent levelling off in 2021 are also captured by both indices.

Average growth over the 14 years is 1.4% per year for the RRI versus 0.54% per year for the JCHS total R&R market. The RRI suggests growth was somewhat faster over the last decade and a half, but again, we suspect our imperfect technique of deflating the

Figure 15
Fastmarkets Repair & Remodeling Index and JCHS overall R&R market size
Billions of 2019 dollars, index (2019 = 100)



Source: Harvard Joint Center for Housing Studies, Fastmarkets calculations.
Note: JCHS spending data has been adjusted for inflation assuming that two-thirds of reported R&R spending is accounted for by building materials and the remaining third is labor costs.

JCHS benchmark with a constant mix of building material and labor weights, along with other measurement challenges with both indices, accounts for the difference. As with the LIRA, 2012 and 2016 both stand out as individual years in which the growth rates differed the most. The average difference between the growth rates from 2008 through 2021 is 0.85% per year, but it falls to 0.30% per year if those two years are excluded.

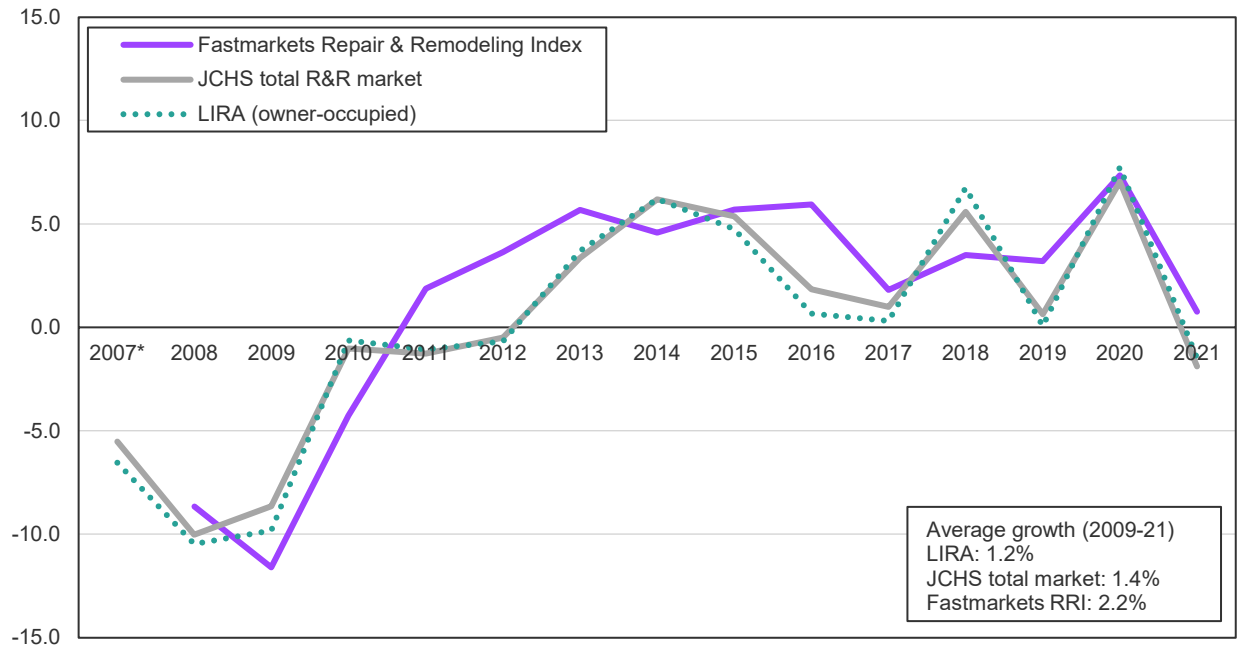
We will continue to refine our approach for comparing our new Repair & Remodeling Index against the three indicators above, but at the moment we are encouraged

that the index seems to closely follow general trends in the market. It is also encouraging that the RRI appears to capture big momentum shifts in the market, potentially in advance of the more robust JCHS benchmark and LIRA methodology. We find far fewer redeeming qualities in the C-30 data, especially in recent years, but we will continue to track the relationship closely with the RRI over time, particularly as historical revisions are incorporated. We are hoping the RRI will continue to indicate the direction of AHS-based revisions to each of these other sources of information on the R&R market ahead of time.

Figure 16

Fastmarkets Repair & Remodeling Index, LIRA and JCHS total R&R market

Annual percentage change



Source: Harvard Joint Center for Housing Studies, Fastmarkets calculations.

Note: LIRA data has been adjusted for inflation assuming that two-thirds of reported R&R spending is accounted for by building materials and the remaining third is labor costs.

* RRI growth rate in 2007 omitted due to the lack of a full year of data in 2006.