NAHB-Wells Fargo Housing Market Index (HMI) as a Leading Indicator

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NAHB and Wells Fargo produce the Housing Market Index (HMI) every month in an attempt to provide an advance indication of the strength of the housing market, especially the single-family market, in the U.S. The HMI is widely used (for example by the Federal Reserve Board and Wall Street firms) and frequently quoted in the media.

When first introduced in 1995, the HMI seemed to track housing statistics like starts and new home sales quite well. With changes that have taken place since, particularly the recent housing boom and subsequent slowdown in housing production, it's time to reexamine the HMI and see to what extent it retains its power to predict housing activity.

What is the HMI?

The HMI is based on a survey that has been mailed to a panel of NAHB builder members every month since January 1985. The survey asks builders to rate housing market conditions based on their experiences. About 400 useable responses are obtained each month. The rationale behind the survey is that builders, with their experience and close contact with local market conditions, can provide useful information about how housing markers are likely to behave in the future. The survey is representative of what builders feel. The housing starts are results of their collective behavior.

The Housing Market Index (HMI) is a weighted average of responses to survey questions asking builders to rate three aspects of their local market conditions: single family detached new home sales at the present time, single family detached new home sales expected in the next 6 months, and traffic of prospective buyers in new homes.[1] The weights used in the HMI (0.592 for sales at the present time; 0.136 for sales expected in next 6 months, and 0.272 for traffic) were chosen in 1994 to make the HMI

[1] Present and expected scales rated on a scale of Good, Fair and Poor. Traffic is rated on a scale of Very High to High, Average and Low to Very Low. A component index is calculated by first seasonal adjusting the percentage of responses in the Good/High and Poor/Low categories. Then the formula [(Good/High - Poor/Low +100)/2] is applied to the seasonally adjusted numbers to produce an index. This formula puts each index on a convenient scale. If all respondents answer "Good/High" then the index is 100. If all respondents answer "Poor/Low" then the index is 0. If equal numbers of respondents answer "Good/High" and "Poor/Low", the index is 50.

correlate as well as possible current and future single-family housing starts at that time.[2] Although the questions in the builder survey ask about new home *sales*, NAHB economists at the time believed that the housing *starts* series produced was inherently more predictable than the series on new home sales produced by the U.S. Census Bureau. For that reason, ability to predict starts was emphasized when the HMI was being developed. Starts and new home sales are correlated, however, so a statistic that predicts one series well is likely to have some ability to predict the other as well.

When it was developed, the HMI series was calculated back to the start of the survey, so that more than two decades of history are now available for analysis.

Trends

In those two-plus decades of history, the HMI has generally appeared to track single-family housing starts quite well (Figure 1). For example, both series reached peaks in December, 1998. Graphically, the HMI also appears to track single family sales (Figure 2), although perhaps not quite as well as starts. It's advisable to be cautious when trying to draw conclusions from a visual inspection the graphs, however. The HMI is on a different scale than either starts or sales. For that reason, it's possible to make the HMI lie on top of one the other series over a particular time period simply by adjusting the scale of the axes.

One reason this is an issue is that the HMI is constrained to lie between 0 and 100, while starts and sales are unbounded at the top end, and in fact have been trending upward since NAHB introduced the HMI. Readers should keep this in mind when looking at the relationship between the HMI and either starts or sales. When responding to survey questions in the last few months, builders may be comparing the current performance with record-high performances a year ago. Thus, 1.3 million single-family housing starts or about 1.0 million single-family new home sales may now appear "poor" to builders, who might have considered it "fair" or even "good" in a year like 1995 (when there were 1.08 single family starts) or 2000 (when there were 1.23 single family starts).

Even if one series has trended upward while other has not, the HMI may still retain its ability to predict fluctuations out to six months. This ability is evident over certain periods in Figure 1, especially during brief periods when the HMI fell or rose sharply ahead of starts. In 1994-95, for example, the HMI fell before the starts series began its downward movement. More recently, the HMI started falling steadily in

[2] A simple eight equations model to the data is fitted. One of the equations defines the HMI as a latent (unobserved) variable that is a linear combination of the three diffusion indices with coefficients constrained to sum to 1. The other seven equations regress current and future single family starts on the latent variable. Thus, correlations with current and future starts determine the weights for the HMI.

November 2005, while single-family housing starts were ascending to a record high in January 2006 and didn't begin contracting until March of that year.

Further Analysis

Given the difficulties involved in trying to draw conclusion by visually inspecting a graph of two series that lie on different scales, we turn to statistics for further insight. The HMI and most of its components correlate strongly with either single-family housing starts (Table 1) or new single-family new home (Tables 2) out to six months in the future. The correlations of the HMI, its single family sales at present component index, and its expected single family sales component index are above 70% in all cases shown in the table. The HMI and its components correlate with single-family starts slightly better than the new home sales, although where the correlations are above 70% in Table 1 the equivalent numbers are above 65% in Table 2.

Among the three components of the HMI, the correlations with starts or sales are by far the lowest for customer traffic. A plausible explanation for the low traffic correlations could be a reduced importance of model homes in the marketplace, due to the emergence of Internet-based tools.

Of the three HMI components, the single-family present sales index has historically had the strongest correlation with starts, and this remains true in 2007. In the past, the HMI correlated better than any of its component indices with starts two to six months in the future. At present, the HMI-starts correlations are consistently lower than the single family present-starts correlations (due primarily to the low correlations associated with the traffic component incorporated into the HMI), but the differences are not great.

Although we've shown that the HMI correlates well with single-family starts and new home sales, it's well known that other variables—such as interest rates—are also correlated with starts and sales. This leads to a natural question about whether producing the HMI is worth the cost. Does the HMI actually enable the Federal Reserve, Wall Street firms, and others to predict housing variables better than they would without it?

We test this with a statistical procedure used previously by Jack Goodman, during the period when he was working for the Federal Reserve Board of Governors and reporting to Alan Greenspan. Writing in 1994 (before the HMI was introduced), Goodman concluded that the NAHB builder survey did at that time help to predict housing starts, and in fact was the only "attitude survey" that could help predict housing variables in a meaningful way.

The approach is conceptually simple—we start with a model that predicts starts or sales without the HMI, and then see if adding the HMI improves the model's ability to predict the housing variables. Due to the plethora of changes that have hit the U.S. housing market in the past two decades, we also test the this over different timeframes. In particular, we're interested in knowing if the HMI can predict housing activity as well in the 21st century as it did when it was first being developed.

The results, which are somewhat technical, are shown in the attached appendix. In brief, the appendix shows that the HMI contributes significantly to the models and helps them predict new single-family starts, irrespective of the time frame studied. The HMI continues to have power to predict starts after 2001 just as it did before 1995.

Similarly, the HMI retains its power to predict new single family home sales, although the statistical results over some time frames are not as strong for sales as they are for starts. This makes sense in that, not only did NAHB design the HMI specifically to help predict starts, but starts is the variable that the builders in the survey have direct control over. The survey asks builders about future activity, and future starts are results of their collective behavior. So the fact the HMI helps predict starts means that builders, in practice, do seem follow their own indicators and often end up behaving the way they tell NAHB they are going to on the survey. It should really come as no surprise that the opinions of builders recorded in the survey track their willingness to break ground.

Conclusion

The NAHB-Wells Fargo HMI continues to have significant power to predict single family housing starts. It has some ability to predict sales as well, but does better at forecasting starts. The task it was specifically designed to do.

The HMI's predictive power appears to be as strong in the post-2000 period as it was earlier in its two-decade history. Over the past twenty years, many things have changed in the U.S. housing market. For example, homebuilders are increasingly relying on web-based platforms to sell their products. The concept of displaying a model home is fast becoming old-fashioned. This may be one reason that the HMI component based on traffic of prospective buyers doesn't have an extremely high correlation with housing starts. As a result, the overall HMI (which incorporates the traffic component) now correlates less well with future starts than does its component index based only on builder ratings of current new single family sales.

This raises a question about whether the weight of the traffic component in the HMI should be reduced, or if the HMI should be replaced entirely with an index based only on present single family sales. However, given that the single family present index outperforms the HMI only by a very small margin (in terms of its correlation with future starts), that there's no guaranty this difference will persist in the future, that there's an interest in maintaining historical consistency of the series, and that the public has expressed a strong interest in seeing an overall measure that incorporates all three components, there seems to be no compelling reason for changing the NAHB-Wells Fargo HMI—which, based on the most recent data and this study, continues to have significant power to predict future housing activity.

References

1. Builders' Economic Council (BEC) Monthly Survey, National Association of Home Builders (NAHB), Economics, January 1985 – December 2006.

2. Emrath, P., (1995), "Housing Market Index", *Housing Economics*, June, pg. 11.

3. Goodman, J. L., (1994), "Using Attitude Data to Forecast Housing Activity", *The Journal of Real Estate Research*, Vol. 9 No. 4, pg. 445-453.

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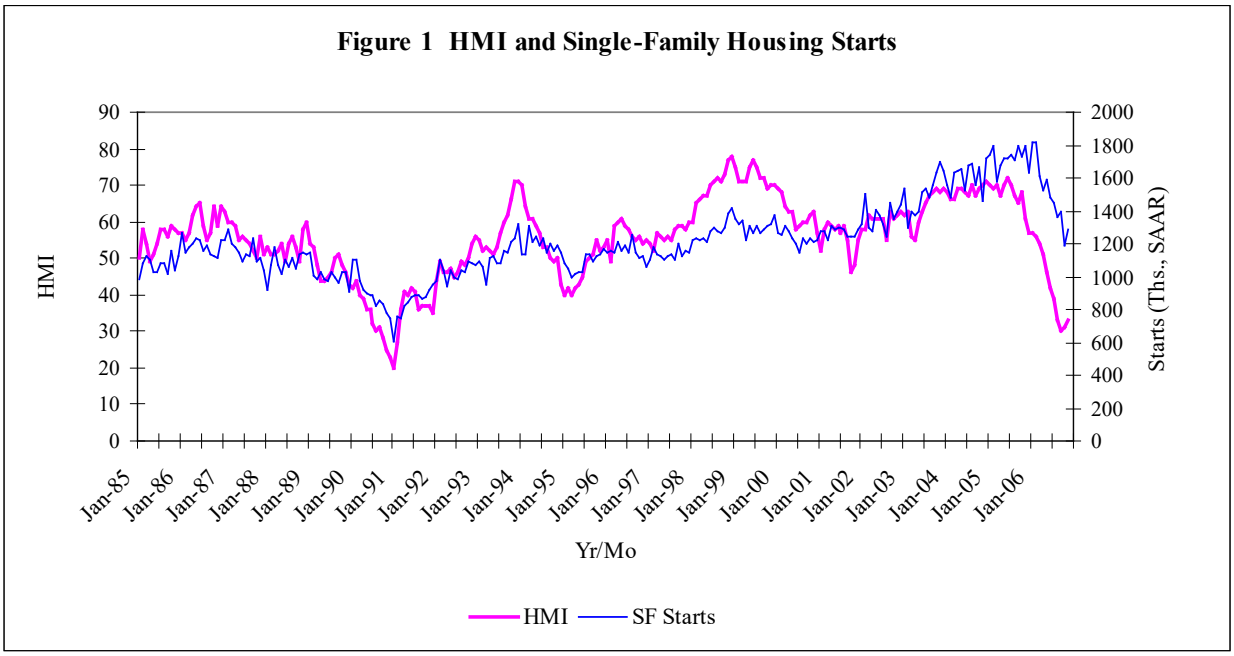
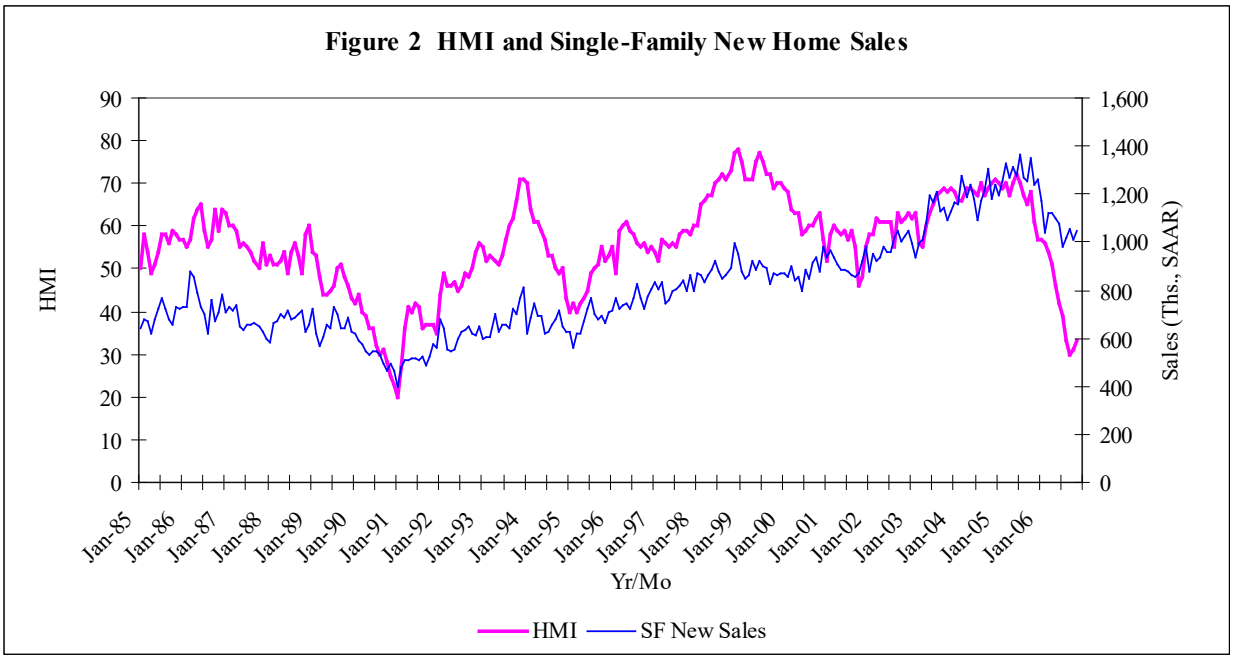
Figure 1 HMI and Single-Family Housing Starts



*SAAR= Seasonally Adjusted at Annual Rate

Figure 2 HMI and Single-Family New Home Sales



*SAAR= Seasonally Adjusted at Annual Rate

Table 1. Correlations with Single-Family Housing Starts (%)

	SF Starts(t)	SF Starts(t+1)	SF Starts(t+2)	SF Starts(t+3)	SF Starts(t+4)	SF Starts(t+5)	SF Starts(t+6)
HMI	72.0	72.7	72.6	72.3	72.5	71.9	70.8
SF Present	74.7	75.1	74.6	74.1	74.6	73.8	72.8
SF Next 6 months	70.1	71.9	72.6	72.1	73.3	72.9	71.9
Customer Traffic	57.9	58.8	59.4	59.4	58.9	58.7	57.5

Table 2. Correlations with Single-Family New Home Sales (%)

	SF New Sales(t)	SF New Sales(t+1)	SF New Sales(t+2)	SF New Sales(t+3)	SF New Sales(t+4)	SF New Sales(t+5)	SF New Sales(t+6)
HMI	68.6	67.9	67.2	66.6	66.7	66.6	65.6
SF Present	71.5	70.8	70.2	69.6	69.9	69.9	68.9
SF Next 6 months	69.1	68.7	68.4	67.7	67.8	67.7	66.7
Customer Traffic	53.4	52.3	51.3	50.6	50.2	50.3	48.9

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Technical Appendix

To analyze the predictive power of the HMI, we use an empirical model inspired by Jack Goodman (1994), who analyzed the predictive power of four different market indices based on survey data. Goodman's approach was to use past values of the housing series to be predicted (starts or sales), current and past interest rates, and current and past values of a particular survey-based measure as explanatory variables. Goodman, writing before NAHB introduced the HMI, used an index based on the single family-present results from the NAHB builder survey as one of the measures. Goodman's basic idea was to investigate if, after already using interest rates and its own past history, a housing statistic could be predicted any better by adding a survey-based attitude measure to the mix. Goodman's conclusion was that, of the four measures he considered, only the one based on the NAHB survey had any meaningful predictive power.

With a longer history now available, which includes many changes in housing market conditions since Goodman wrote his paper, we attempt to find out if the NAHB survey results continue to have predictive power.

We use a method similar to Goodman's. As the survey-based measure in the model, we use the HMI, which is now available and is the measure NAHB publishes explicitly to provide advance information about housing markets. We look at all explanatory variables (interest rates, past starts or sales, and the HMI) at lags of up to six months. Six months is the natural framework for investigating the HMI, which is based on an underlying assumption that builders have the ability to provide useful information about housing markets up to six months in advance. Consistent with this assumption, one of the NAHB survey questions asks builders to rate sales expected over the next six months, and the formula for the HMI was derived to maximize its correlation with starts up to six months in the future.

The models we estimate are thus:

$$Y_t = \alpha + \sum_{n=1}^{6} b_n Y_{t-n} + b_{12} Y_{t-12} + \sum_{m=0}^{6} c_m W_{t-m} + \sum_{k=0}^{6} s_k X_{t-k} + e_t \qquad (1)$$

Y_t = a measure of housing market activity in month t, e.g. single-family housing starts or single-family new home sales, SAAR

W_{t-m} = 30-year FRM rate in month *t-m*

X_{t-k} = HMI in month *t-k*.

e_t = stochastic error

We include Y_{t-12} controlling for possible incomplete seasonal adjustment. Interest rates are assumed to be an important determinant of housing demand, and are released prior to housing measures. We used two different model specifications (set of controls) as follows:

$$Y_t = \sum_{n=1}^{6} Y_{t-n} + \sum_{m=0}^{6} W_{t-m} \quad (2)$$

$$Y_t = \sum_{n=1}^{6} Y_{t-n} + \sum_{m=0}^{6} W_{t-m} + \sum_{k=0}^{6} X_{t-k} \quad (3)$$

We use three different time-periods to check the robustness of our findings. Because NAHB calibrated the weights for HMI components late in 1994, we choose 1985 to 1994 to represent conditions when the HMI was introduced. Second, we choose 1995-2001 time period when housing market activities stayed relatively stable. Finally, we look at the post-2001 period that includes a housing boom with American builders breaking grounds for record number of single family homes, and a subsequent correction in 2006, which is somewhat extending into 2007.

We have employed two different models—designed to predict month-to-month and year-over-year changes. The month-to-month model uses the difference between current month's value and previous month's value for all the variables. The year-over-year model uses the difference between current month's value and the value from twelve months previously for all the variables. These are common ways to measure changes at different points in time. Our yardstick for measuring the predictive power of HMI is to look at the change in percentage of variation that is explained by the model when we introduce the HMI.

In most cases, we find that the HMI contributes significantly to the predictive power of the models. In particular, inclusion of the HMI (along with its lagged values) increases ability of the model to predict month-to-month changes in starts from 26.2% to 40.2% over the full history of the HMI (Table A1 in the appendix).

Each cell of the following tables reports the adjusted R^2 from the respective regression. For example, 0.262 in Table A1 is the adjusted R^2 from the regression using model 1 and the full 1985 to 2006 time period. F-tests for the difference in R^2 between model 1 and model 2 are also reported. These tests show the statistical significance of the improvement in predictive power caused by adding the HMI (and its lagged values) to the model.

When we compare the results for shorter time periods (1985–1994, 1995–2000, and 2001–2006), we find similar results. The addition of the HMI improves the predictive power of the model in each time period,

and the diagnostic tests show that the improvement from adding the HMI to the model are statistically significant in all cases in Table A1.

The results are relatively similar for predicting year-over-year changes in starts (Table A2). The addition of the HMI improves the predictive power of the model over the entire 1985-2006 and in each of the three shorter periods within that span. The improvements are statistically significant at a very strong level for all periods except 1995-2000, for which the improvement narrowly misses being significant at 10% level.

Increase in predictive power due to the introduction of HMI is also evident when we look at month-to-month changes in new home sales (Table A3). The improvements for the shorter time periods are not always significant, however, especially for the post 2000 period. For the year-over-year change in sales, the addition of the HMI improves the predictive power of the model significantly over the full 1985-2006 period, as well as within each of the shorter periods except for 1995-2006 (Table A4).

Table A1. Model for Predicting Month-to-Month Changes in Single-Family Housing Starts

	(1)	(2)	(3)	(4)
Explanatory Variables	1985—2006	1985—1994	1995—2000	2001—2006
1. Lagged Starts and Lagged Interest Rates	0.262	0.315	0.256	0.441
2. Lagged Starts, Lagged Interest Rates, and Lagged HMI	0.402	0.465	0.506	0.632
Test of Significance (inclusion of HMI in (2))	F(7, 229) = 7.70 Prob. > F= 0.000	F(7, 85) = 3.82 Prob. > F= 0.003	F(7, 50) = 3.62 Prob. > F= 0.003	F(7, 50) = 3.71 Prob. > F= 0.003

The numbers in the interior of the table are the adjusted R^2 statistics from the relevant regressions.

Table A2. Model for Predicting Year-over-Year Changes in Single-Family Housing Starts

	Time Period			
Explanatory Variables	1985—2006	1985—1994	1995—2000	2001—2006
1. Lagged Starts and Lagged Interest Rates	0.642	0.667	0.764	0.701
2. Lagged Starts, Lagged Interest Rates, and Lagged HMI	0.713	0.787	0.811	0.809
Test of Significance (inclusion of HMI in (2))	F(7, 218) = 7.68 Prob. > F= 0.000	F(7, 74) = 5.98 Prob. > F= 0.000	F(7, 50) = 1.72 Prob. > F= 0.125	F(7, 50) = 4.08 Prob. > F= 0.001

The numbers in the interior of the table are the adjusted R^2 statistics from the relevant regressions.

Table A3. Model for Predicting Month-to-Month Changes in New Single-Family Home Sales

Explanatory Variables	Time Period 1985—2006	1985—1994	1995—2000	2001—2006
1. Lagged Sales and Lagged Interest Rates	0.285	0.337	0.501	0.384
2. Lagged Sales, Lagged Interest Rates, and Lagged HMI	0.335	0.411	0.608	0.448
Test of Significance (inclusion of HMI in (2))	F(7, 229) = 2.47 Prob. > F= 0.018	F(7, 85) = 1.52 Prob. > F= 0.173	F(7, 50) = 1.97 Prob. > F= 0.078	F(7, 50) = 0.83 Prob. > F= 0.569

The numbers in the interior of the table are the adjusted R^2 statistics from the relevant regressions.

Table A4. Model for Predicting Year-Over-Year Changes in New Single-Family Home Sales

Explanatory Variables	Time Period 1985—2006	1985—1994	1995—2000	2001—2006
1. Lagged Sales and Lagged Interest Rates	0.688	0.705	0.568	0.792
2. Lagged Sales, Lagged Interest Rates, and Lagged HMI	0.723	0.798	0.603	0.841
Test of Significance (inclusion of HMI in (2))	F(7,218) = 3.90 Prob. > F= 0.000	F(7, 74) = 4.86 Prob. > F= 0.000	F(7, 50) = 0.64 Prob. > F= 0.721	F(7, 50) = 2.12 Prob. > F= 0.058

The numbers in the interior of the table are the adjusted R^2 statistics from the relevant regressions.