MACROECONOMIC ADVISERS
By IHS Markit

Macro Focus

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IHS Markit versus ISM Manufacturing PMI

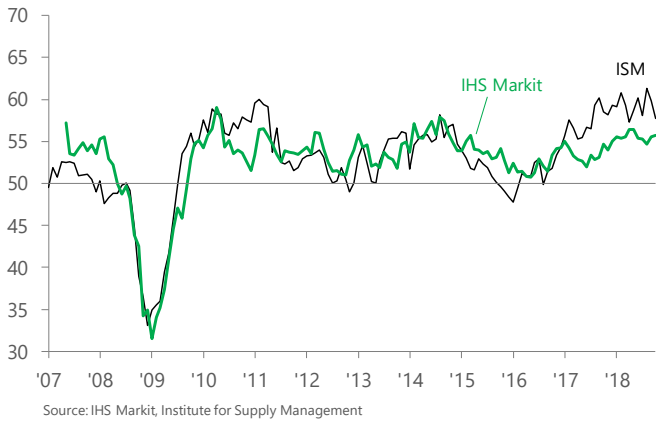
Both IHS Markit and the Institute for Supply Management (ISM) compute composite indexes covering the US manufacturing sector. Both are weighted up from component diffusion indexes measuring five economic concepts: manufacturing output, new orders, employment, supplier delivery times, and inventories. Both sets of diffusion indexes are survey-based measures in which respondents are queried about the current month's activity relative to one month prior. Until recently, the two manufacturing composite indexes tracked each other quite closely. But beginning in early 2017, the ISM index moved sharply and persistently above the IHS Markit index (see Figure 1). This has presented a conundrum for analysts who rely on these indexes as indicators of the health of the manufacturing sector: which one is providing a better signal? In this note, we investigate whether either index has recently become "disconnected" from the underlying economic concepts. We present evidence supporting the view that the ISM PMI has, and the IHS Markit PMI has not, suggesting the latter is providing a better signal.

Our approach

Our approach to testing whether either *composite* index has become disconnected from the underlying economic concepts is to test whether the relationships between the *component* indexes and their corresponding economic concepts have recently undergone a structural change.[1] Of the five component indexes included in both, four have corresponding (and measured) economic concepts. The "output" index (or "production" index from ISM) corresponds to manufacturing industrial production from the Federal Reserve. The "new orders" index corresponds to manufacturers' new orders from Census. The "employment" index corresponds to manufacturing employment from Bureau of Labor Statistics. The "stocks of purchases" index (or "inventories" index from ISM) corresponds to materials and supplies inventories from Census. The "suppliers' delivery times" index does not have an obvious and measured corresponding economic concept, so we leave it out of the analysis.

Figure 1: IHS Markit vs ISM Manufacturing Index

composite diffusion indexes (50 = neutral)



Source: IHS Markit, Institute for Supply Management

We begin by positing a relationship between the component indexes and the corresponding economic concepts. Take, for example, the component index measuring production. Let Z_t be growth of manufacturing industrial production (the underlying economic concept) and let $INDEX_t$ be the level of the production index. We assume

$$(1) \qquad Z_t = a \cdot (INDEX_t - b) + e_t$$

[1] The formal test that we employ is a Chow test.

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where a and b are parameters to be estimated and e_t is a mean-zero error term.[2] In this specification, b is the level of $INDEX$ corresponding to zero (expected) growth of manufacturing IP, and a scales differences of $INDEX$ from the neutral level of b to (expected) growth of manufacturing IP. We use this general specification for each of the component-index regressions, although growth of the economic concept (the dependent variable) is defined differently across the regressions.[3]

Analysis

The table on page 4 reports on the output of eight regressions. All have the form of equation (1) above. The component index and dependent variable (Z_t) are indicated in the left-most column. The results under the "IHS Markit" heading use IHS Market component indexes for independent variables ($INDEX_t$), and the results under the "ISM" heading use ISM component indexes for independent variables.

Consider, for example, the top row of results. An estimate of equation (1) using the 3m/3m percent change of manufacturing IP as the dependent variable (Z_t) and the IHS Markit output index as the independent variable ($INDEX_t$) yields a neutral value (b) of 53.6 and a slope (a) of 0.3.[4] The r-squared of the regression is 0.79. Figure 2A shows the dependent variable and fitted value from this regression. The right portion of the top row reports an estimate of equation (1) using, instead, the ISM production index as the independent variable. The neutral value and slope estimates from this regression are somewhat different, and the fit (r-squared = 0.67) is not as good as with the IHS Markit output index. Figure 2B shows the actual and fitted value from this regression.

A comparison of Figures 2A and 2B reveals one source of the recent divergence between the IHS Markit and the ISM composite manufacturing PMI's. Since mid-2017, fitted growth of manufacturing IP using the ISM production index has risen generally above actual growth of manufacturing IP. The same is not true for fitted growth of IP using the IHS Markit index. The two component indexes receive similar and material weights in their respective composite PMI's, so this recent differential performance is contributing to the recent gap between the composite indexes.[5] Furthermore, because the ISM production index is overpredicting growth of manufacturing IP, recent readings on the ISM production index are contributing to an overstatement of the health of the manufacturing sector as indicated by the ISM composite index.

The recent run of one-sided errors in the ISM production equation could indicate a structural break in the relationship between manufacturing IP and the ISM production index, or it could simply be a statistical fluke in the context of an otherwise stable relationship.

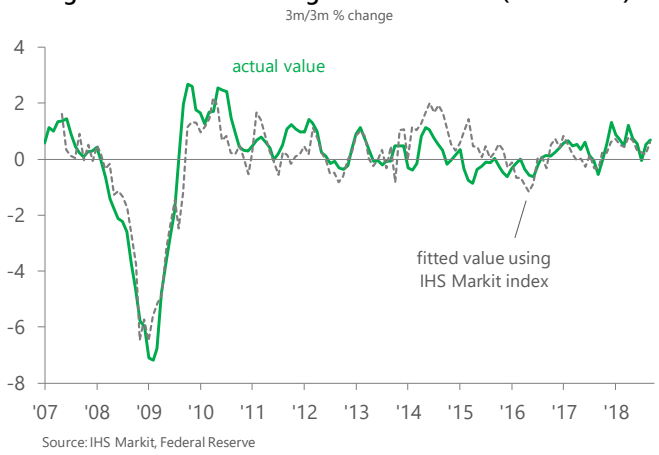
[2] Recall the level of the component indexes measure a change in activity, making appropriate a relationship between the level of the component index and growth of the corresponding economic concept.

[3] We view the question of the appropriate transformation of the underlying economic data as largely an empirical one: which transformation yields the highest correlation with the corresponding component index? Through some casual inspection of the data, we have found that for production and new orders, an appropriate transformation of the economic data is the percent difference between the three-month moving average and its third lag (3m/3m percent change). For employment, an appropriate transformation is the one-month change, and for inventories, an appropriate transformation is the one-month percent change. Whether these transformations are, in fact, the most appropriate is not as important as whether their relationships with the underlying economic data recently have been stable, which is the focus of this note.

[4] As noted in the table, the sample for all regressions is May 2007 through September 2018 and all reported parameter estimates are significantly different from zero at 1%.

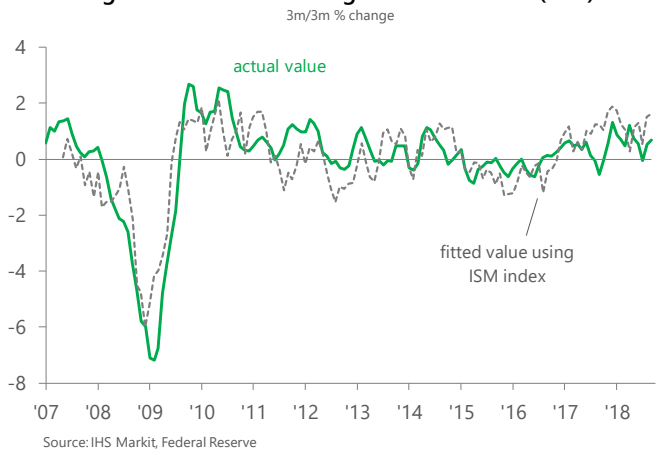
[5] The ISM production index receives a weight of 0.20 in its composite index, and the IHS Markit output index receives a weight of 0.25 in its composite index .

Figure 2A: Manufacturing IP & fitted value (IHS Markit)



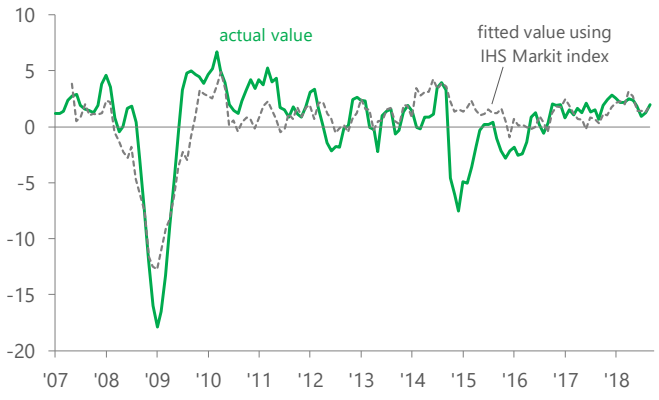
Source: IHS Markit, Federal Reserve

Figure 2B: Manufacturing IP & fitted value (ISM)



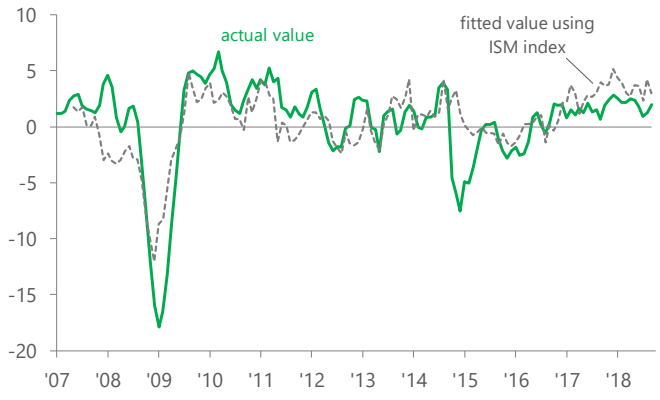
Source: IHS Markit, Federal Reserve

Figure 3A: Mfg new orders & fitted value (IHS Markit)



Source: IHS Markit, Census Bureau

Figure 3B: Mfg new orders & fitted value (ISM)



Source: IHS Markit, Census Bureau

To test this, we employed a Chow test of the null hypothesis that there was no structural break in equation (1) beginning in June 2017 for both the ISM production regression and the IHS Markit output regression.[6] The p-values for these tests are reported in the table. For the ISM production equation, we reject the null hypothesis of no structural break in June 2017 at the 1% level of significance. For the IHS Markit output equation, we cannot reject the null. This suggests that recently the relationship between the ISM production index and manufacturing IP has changed, while the relationship between the IHS Markit output index and IP has not.

The balance of the table reports on the regression and Chow-test results for the remaining three component indexes. For the new orders equations, the results are similar to the output/production equations. The IHS Markit regression has a somewhat better in-sample fit than the ISM regression. Figures 3A and 3B show the actual and fitted values from both regressions. A recent run of overpredicting growth of new orders is evident in the ISM equation and is not in the IHS Markit equation. The Chow test of no structural break in June 2017 in the ISM relationship is rejected at 5% (not so for the IHS Markit equation), supporting the notion that relationship between the ISM new orders index and actual new orders recently has changed (and has not for the IHS Markit index).

For the employment and inventories indexes, the results are different from output/production and new orders indexes. For employment, the fit of the ISM and IHS Markit regressions are essentially the same, and neither regression appears to exhibit a structural break recently. For the inventories index, the ISM index has a

[6] The choice of June 2017 was based on when the residuals in the ISM regression first turned (generally) persistently negative. We get the same results — reject for ISM, do not reject for IHS Markit — using break points several months in either direction.

Component Indexes: Fit and Stability Test

	IHS Markit				ISM			
	slope (a)	neutral value (b)	R^2	Chow test p-value	slope (a)	neutral value (b)	R^2	Chow test p-value
Output/Production Index								
Manufacturing IP (3m/3m % change)	0.3	53.6	0.79	0.610	0.2	55.9	0.67	0.002
New Orders Index								
Manufacturers' New Orders (3m/3m % change)	0.5	52.1	0.58	0.589	0.4	54.2	0.51	0.025
Employment Index								
Manufacturing Employment (m/m change)	9.7	53.0	0.76	0.256	6.6	53.3	0.75	0.185
Stocks of Purchases/Inv. Index								
Mfg. Materials & Supplies Inventories (m/m % change)	0.1	46.4	0.23	0.644	0.1	46.0	0.30	0.819

Notes: The functional form for all regressions is Z = a*(INDEX - b) + e, where Z is the dependent variable indicated in the left column above, INDEX is a component index (IHS Markit or ISM), a is the "slope" parameter, b is the "neutral value" parameter, and e is a mean-zero error term. The sample for all regressions is May 2007 to September 2018. "3m/3m % change" is the percent difference between the 3-month moving average and its third lag. All estimated parameters are significant at 1%. The Chow test (F-test) is for the null hypothesis of no structural break in June 2017.

somewhat better in-sample fit than the IHS Markit index. Neither hints at a recent structural break.

Conclusion

Taken together, the results reported here suggest that recent readings on the IHS Markit composite PMI for manufacturing are more indicative of the underlying health of the manufacturing sector than recent readings on the ISM composite index. This is because two of the ISM component indexes, which together account for 40% of the composite index, recently have overstated growth of their corresponding economic concepts: manufacturing IP and manufacturers' new orders. For both component indexes, the recent overstatement of growth has been so much as to suggest a statistical break in the relationship between the component indexes and the economic concepts. The same cannot be said for the IHS Markit component indexes. Therefore, to get a clean read on the recent health of the manufacturing sector, one could adjust the ISM data lower to account for the statistical break, or simply follow the IHS Markit PMI … we suggest the latter.

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