

HPS-CivicScience Economic Sentiment Index

Consumer confidence and the economy



Fall 2016

Authored by Hamilton Place Strategies & CivicScience

Analysis conducted by Tower Street Associates

About This Report

This report is based on analysis of the Hamilton Place Strategies-CivicScience Economic Sentiment Index (ESI) by Tower Street Associates, a quantitative investment advisory firm, and is written in conjunction with Hamilton Place Strategies and CivicScience. All other analysis in the paper is conducted by HPS and CivicScience.

The report examines the relationship between the ESI and other major consumer confidence indices as well as each indices' relative explanatory power of macroeconomic outcomes, particularly personal consumption expenditures and retail sales.

Tower Street Associates

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Special Thanks

A special thanks to Maya Arrieta-Walden, Jesse Steinmetz, Nahiomy Alvarez, and Aidan McConnell for their efforts in preparing the report.

About The Hamilton Place Strategies-CivicScience Economic Sentiment Index

The HPS-CivicScience Economic Sentiment Index (ESI) is a “living” index that measures U.S. adults’ expectations for the economy going forward, as well as their feelings about current conditions for major purchases. The primary goal of the ESI is to accurately measure movements in overall national economic sentiment, and to provide a more sophisticated alternative to existing economic sentiment indices. Unlike other prominent indices that release consumer sentiment estimates infrequently, the HPS-CivicScience Economic Sentiment Index is updated in real time as responses are collected continuously every hour, every day. Large-scale cross-tabulation of survey responses and consumer attributes enable more granular analyses than are currently possible through prevailing measures. <http://hps-civicscience.com>

Hamilton Place Strategies

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CivicScience

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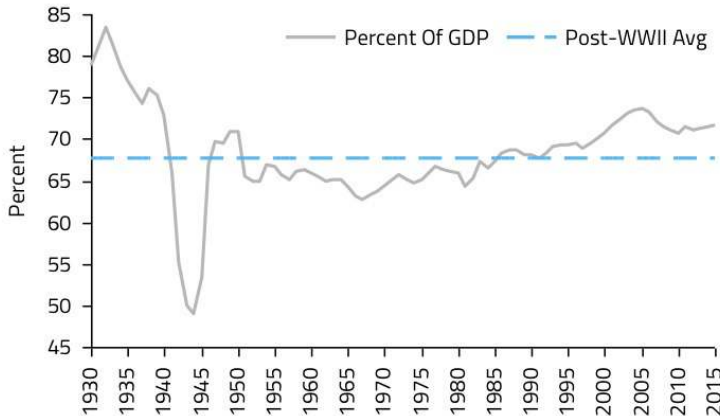
Executive Summary

Economic growth in the U.S., and even in the global economy, often hinges on the American consumer. Since 1929, consumption and residential investment by American consumers has driven roughly 65 percent of gross domestic product (GDP). Even as global growth has reduced the relative size of the U.S. economy, the U.S. consumer still plays an important role in shaping global economic fortunes.

U.S. economic data collection, reporting, and market reactions are often driven by the well-being and outlook of the U.S. consumer. For example, unemployment reports gauge the health of the labor market for job-seekers, while price indices show changes in the cost of living that will drive consumer behavior for the coming months and years. These reports drive markets and policy-making. However, there is another set of indices that seeks to provide a more direct window into how American consumers feel: consumer confidence indices.

Fig. 1 The U.S. Consumer Drives The Economy

Personal Consumption And Residential Investment As A Percent Of GDP



Source: BEA

As former Chairman of the Federal Reserve Ben Bernanke explains, "These (consumer confidence) surveys have proved useful in forecasting consumer spending and other aspects of household economic behavior, and they are accordingly closely followed by economists."¹

The Federal Reserve first began to collect data to measure U.S. consumer sentiment in the 1940s. Since then, consumer indices have evolved in tandem with theories on how to predict important economic trends. Today, three

main surveys of consumer attitudes are issued by the Conference Board (CB), Bloomberg (CCI), and the University of Michigan (UM), and are released regularly.

¹Ben Bernanke, "How Do People Really Feel About The Economy?" [Brookings Institution](#), 6/30/16

This paper compares these indices to the newly developed HPS-CivicScience Economic Sentiment Index (ESI). Of note, most of the analysis calculates the ESI on a monthly basis for a “fair” comparison. However, the ESI is available on a weekly, daily, and even real-time basis.

Key findings are:

- **No other indicator performs as well as the ESI at both explaining and predicting changes in personal consumption expenditures (PCE) and retail sales, including tests factoring in other macroeconomic control variables.** The monthly ESI is the best predictor of PCE and retail sales. Moreover, the ESI outperforms the other indices in explaining the same month’s headline retail sales numbers and the following seven disaggregated categories: Auto and Other Motor Vehicles; Food and Beverage Stores; Furniture and Home Furnishings Stores; Food Services and Drinking Places; Health and Personal Care Stores; Motor Vehicle and Parts Dealers; and Sporting Goods, Hobby, Book, and Music Stores. Looking broadly across all retail sales segments, no other indicator performs as well.
- **Multiple statistical analyses find the ESI leads PCE and retail sales, and provides a better forecast than other indices.** First, a cross-correlogram analysis finds the ESI leads PCE and retail sales three months out. Therefore, a rise in the ESI would suggest retail sales will rise next quarter. This finding is statistically significant. Second, Granger causality tests also find the ESI leads personal consumption expenditures and retail sales. These results are statistically significant at the 1 percent level.
- **The ESI tends to lead other consumer sentiment indices. In particular, the ESI calculated at a monthly rate leads the UM Index.** This result, derived from a Granger causality test, is statistically significant at the 0.1 percent level and is supported by other statistical analyses.
- **When calculated at a weekly rate, the ESI is an even better leading indicator for the other indices.** The weekly ESI significantly leads the CCI, a four-week rolling average, at weekly lags for up to three weeks.

Overall, this analysis shows that market participants, policymakers, and marketing professionals acting on ESI data will be using an index that best predicts real economic outcomes when compared to competitors. Further, the ESI’s high frequency and short construction delays provide fresh and timely insights.

There are four factors most likely driving these superior results:

- **Innovative Collection Method:** The backbone of the ESI is CivicScience’s network of web-based applications distributed across third-party websites and a proprietary web portal that engages

consumers who volunteer answers to questions. This approach has two distinct advantages. First, as landline phone ownership and conventional panel-based survey participation rates continue to decline, the ESI is well-positioned to capture sentiment. Second, responses are collected from a broader, less biased pool of respondents.

- **Large Sample Size:** The ESI collects 9,250 responses per month on average. This sample is three-times larger than the next closest competitor and nearly 20 times larger than the UM Index.
- **Real-Time Availability:** Unlike other indices, the ESI is updated in real time with responses collected continuously every hour, every day from people in all 50 states. The ESI can be assessed at any given moment.

For further information regarding this report, visit [HPS-CivicScience.com](https://www.hps-civicscience.com).

I. A Brief Introduction To The HPS-CivicScience Economic Sentiment Index

Since 2013, the HPS-CivicScience Economic Sentiment Index (ESI) has measured U.S. adults' expectations for the economy going forward, as well as their feelings about current conditions for major purchases. Like other indices, the primary goal of the ESI is to accurately measure movements in overall national economic sentiment, and to provide a more sophisticated alternative to existing economic sentiment indices.

The ESI is updated in real time with responses collected continuously every hour, every day from people in all 50 states. Large-scale cross-tabulation of survey responses and consumer attributes enable more granular analyses than are currently possible through prevailing measures. For example, the ESI can be cross-tabulated by typical demographic attributes such as age, income, region, gender, race, and education. However, it can also be calculated by more granular attributes such as sensitivity to energy prices, homeownership, and even favorite football team.

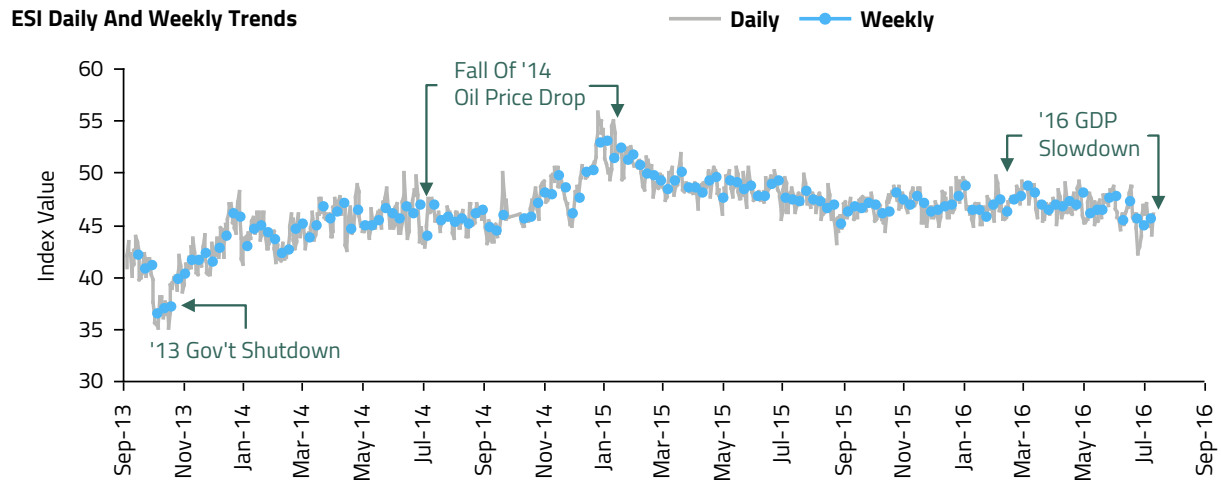
“Unlike other prominent indices that release consumer sentiment estimates infrequently, the HPS-CivicScience Economic Sentiment Index is updated in real time as responses are collected continuously every hour, every day.”

The backbone of the ESI is CivicScience's network of web-based polling applications distributed across third-party websites and a proprietary web portal that engages consumers who volunteer answers to questions.

This approach has two distinct advantages:

1. **As landline phone ownership and conventional panel-based survey participation rates continue to decline, the ESI is well-positioned to capture sentiment.** The decline in landline use is not going to reverse. With caller ID and do-not-call lists, cell phones are increasingly missing a broad swathe of the population. Additionally, the people who participate in conventional survey panels comprise a small subsection of the U.S. population. Research has also found that survey panelists differ from the U.S. general population, leading to “psychographic bias.” These three methods are simply not built for the technology of today. CivicScience’s web-based networks meet people where they are in order to reduce frictions in collecting poll responses.
2. **Responses are collected from a broader, less biased pool of respondents.** CivicScience respondents answer three to four questions during each session, including two to three attitudinal questions. The first is designated as an “Engagement” question, designed to compel respondents to participate. The remaining questions are either “Value” questions, designed for

Fig. 2 The ESI Tracks The Macro Economy And Impacting Events



commercial purposes, or “Profile” questions, which ask respondents about more general attributes such as demographics and personality traits. The quick nature of this interaction, combined with the fact that respondents receive no monetary incentive, results in a less biased sample overall.

This method and network enable the ESI to capture broad swathes of consumers every hour or every day far more efficiently and accurately than other collection methods. It is also best positioned to succeed as landline and cell phone use and paid survey panel participation continue to decline.

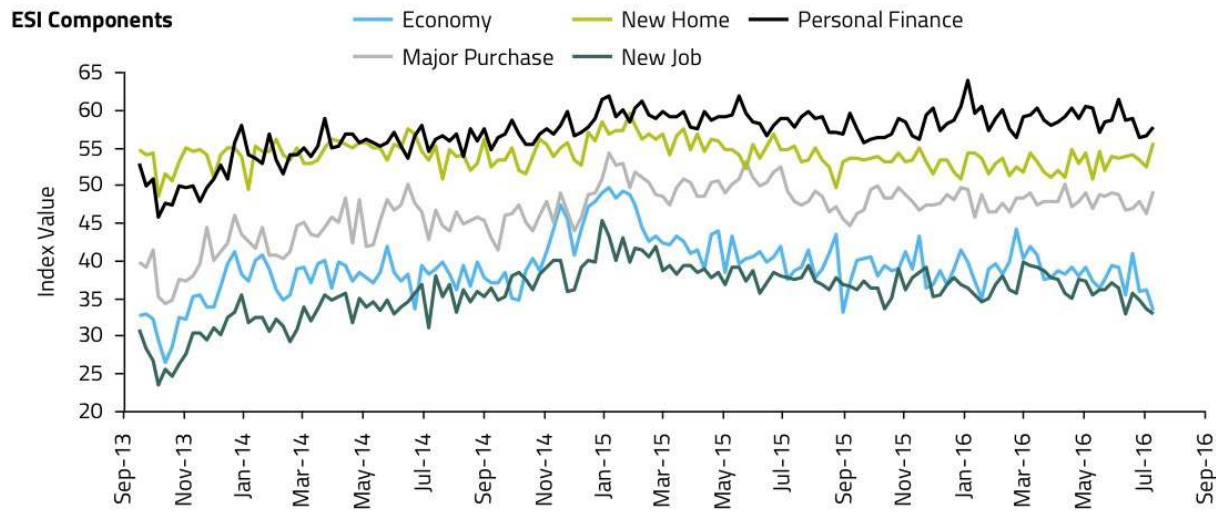
ESI Overall And Component Trends Since 2013

Since the ESI launched at the beginning of 2013, it has tracked the macro economy closely and proved to be useful in clarifying public policy discussion (Fig. 2).

The ESI reacted quickly to the government shutdown in the fall of 2013, the oil price drop in the fall of 2014, and the slowdown in GDP in the first half of 2016.

Moreover, the ESI's unique ability to be crossed with different populations drove more in-depth analysis. For example, the oil price drop in the fall of 2014 triggered a significant rise in virtually all consumer confidence indices albeit at different times and at different rates. With the ESI, however, one can tell if the oil price drop was the main driver or if other factors were at play by segmenting the respondent universe into groups of people who were very concerned, somewhat concerned, and not concerned with gas prices. The ESI rose only for those very and somewhat concerned with a much larger jump for those very concerned. For those not concerned, the ESI remained flat. This analysis

Fig. 3 The ESI Tracks The Macro Economy And Impacting Events



suggested that the rise in consumer sentiment in the fall of 2014 was not likely due to other factors, but simply due to the drop in oil prices.

Additionally, student debt and its impact on the economy is driving discussion on the cost of college and how we finance it. Analysis crossing the ESI with education and student debt suggests students still perceive value in their degrees. While having student debt is associated with less confidence, higher levels of education have a stronger effect on consumer sentiment.

Fig. 4 The ESI Is Driven By New Jobs And Major Purchases

Correlation	ESI	New Job	Econ	MP	PF	New Home
ESI	1.00					
New Job	0.94	1.00				
Economy (Econ)	0.86	0.77	1.00			
Major Purchase (MP)	0.91	0.82	0.67	1.00		
Personal Finance (PF)	0.86	0.81	0.59	0.82	1.00	
New Home	0.49	0.35	0.45	0.33	0.21	1.00

Source: Tower Street

The ESI is made up of five questions (Fig. 3):

U.S. Economy (Econ): Looking ahead six months, do you think the U.S. economy will get better, stay the same, or get worse?

New Jobs: Over the next six months, do you think it will become easier or more difficult to find a new job?

Personal Finance (PF): Over the next six months, do you expect your personal financial

situation to get better, stay the same, or get worse?

Major Purchase (MP): Given the current state of the economy, is now a good time or a bad time to make a major purchase like a new car or home improvements?

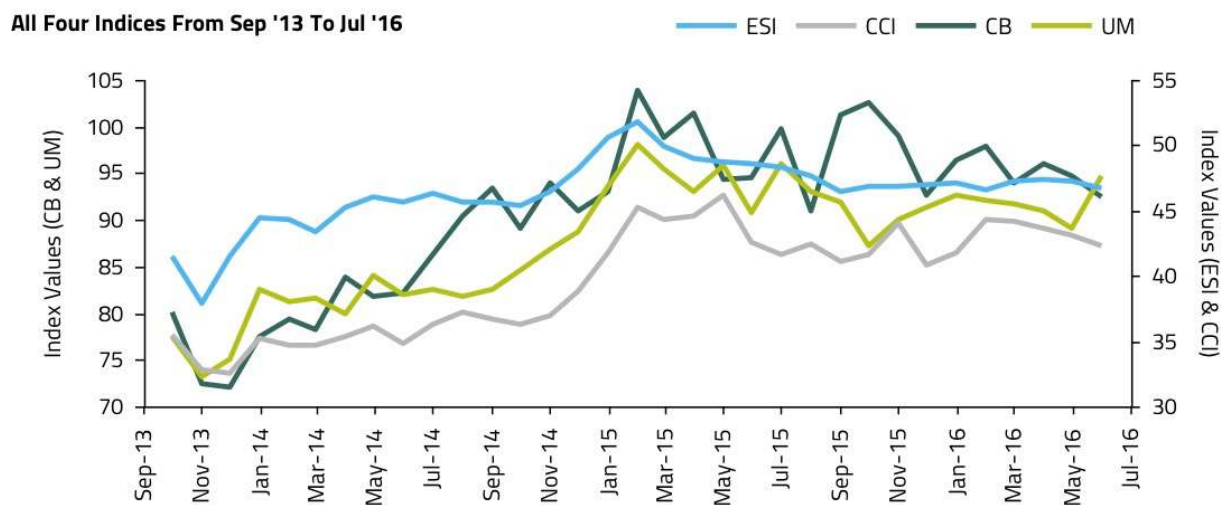
New Home: Given the current state of your local market, is now a good or bad time to purchase a new home?

The ESI is driven primarily by confidence in the labor market and in making major purchases (Fig. 4). However, questions regarding the U.S. economy, new homes, and major purchases correlate less with the ESI. Therefore, they provide new and more valuable information relative to the other sub-indices. In particular, the new home question is a rich source of information, correlating the least with the overall ESI.

II. Comparing The ESI To Other Indices

As stated above, this analysis uses the University of Michigan's Consumer Sentiment Index (UM), Conference Board's Consumer Confidence Index (CB), and Bloomberg's Consumer Comfort Index (CCI) as benchmarks for the ESI. These indices have generally tracked each other since the fall of 2013, but as discussed in detail throughout this paper, they all maintain slightly different methodologies and explanatory power over economic outcomes.

Fig. 5 All Four Indices Generally Track One Another Since Fall Of 2013



Source: Tower Street

University of Michigan's Consumer Sentiment Index

The UM Index is the longest running consumer sentiment index on the market. Built in conjunction with the Federal Reserve in the 1940s, the index is released monthly and is based on 500 responses per month by telephone. The UM Index employs sample stratification, which is a statistical method to ensure responses are representative of the broader U.S. population. The UM Index final reading is released at the end of the month, a few days after its final survey period finishes. This value represents consumer sentiment for the month as a whole. The final release is complemented by a preliminary release in the middle of the month reflecting the responses from the first two weeks.

Conference Board's Consumer Confidence Index

Like the UM Index, the CB Index is released monthly. The sample size is 3,000 with surveys dispersed via physical mail. Like the UM Index, sample stratification is used to ensure responses are representative of the broader population. Unlike the UM Index – and all indices examined in this paper

Fig. 6 The ESI Has A Sample Size Three Times Larger Than Other Indices

	ESI	University of Michigan (UM)	Conference Board (CB)	Bloomberg (CCI)
Frequency	Real Time	Monthly	Monthly	Weekly
Time of Release	Real Time	Friday, 10:00 AM	Tuesday, 10:00 AM	Thursday, 9:45 AM
History	2013-Present	1978-Present	1967-1977 (Bimonthly) 1978-Present (Monthly)	1985-Present
Sample Size	9,250	500	3,000	1,000
Collection Methods	Online	Telephone	Physical Mail	Telephone
Seasonal Adjustment	No	No	Yes	No
Sample Stratification	Yes	Yes	Yes	Yes
Revisions	No	Yes	Yes	No

Source: Tower Street

– the CB Index is seasonally adjusted. The CB Index value for the month is released every fourth Tuesday, reflecting data collected from the first of the month until the 18th. Roughly a week or more passes between survey data collection and the CB Index release.

Bloomberg's Consumer Comfort Index

The CCI is released weekly with the value reflecting a four-week rolling average. The sample size is 1,000

with surveys done over the phone. Released every Thursday, the index value reflects surveys finished four days prior. Like the UM and CB indices, the CCI also employs sample stratification.

The ESI methodology differs from the methodology of these indices in three main ways: it's real-time, it has a larger sample size, and the public release reflects more recent data. On release times, the ESI can be calculated at any moment. It's not restricted to lags in collection and calculation that delay

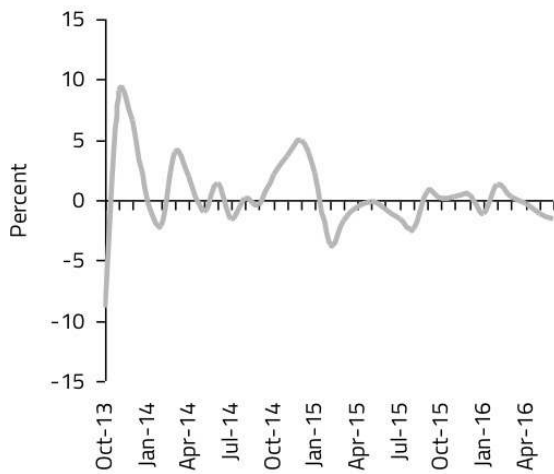
other indices. On sample size, the ESI reaches an average of 9,250 people on average per month, three times the level of the CB Index and nearly 10 and 20 times the level of the CCI and UM Index, respectively.

Growth Rate Comparison

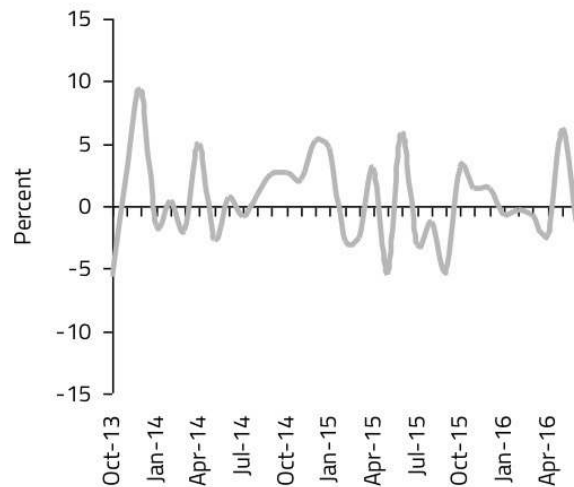
In order to isolate the statistical and economic differences among the indices, this analysis places each index on equal footing. We aggregate the ESI (and the CCI) to a monthly basis to foster a "fair" comparison with the lower frequency UM and CB measures.

Fig. 7 The ESI Monthly Growth Rate Shows Less Volatility Than Other Indices

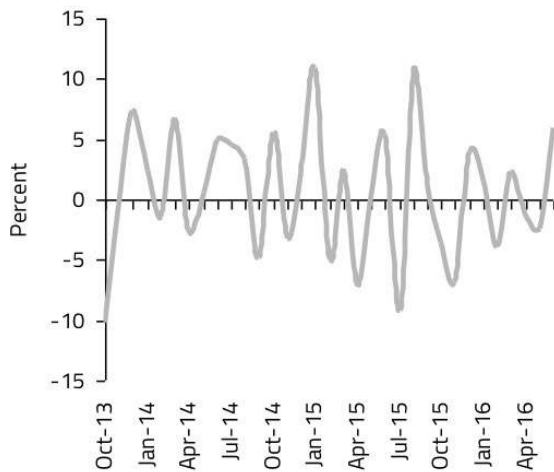
ESI Monthly Growth Rate



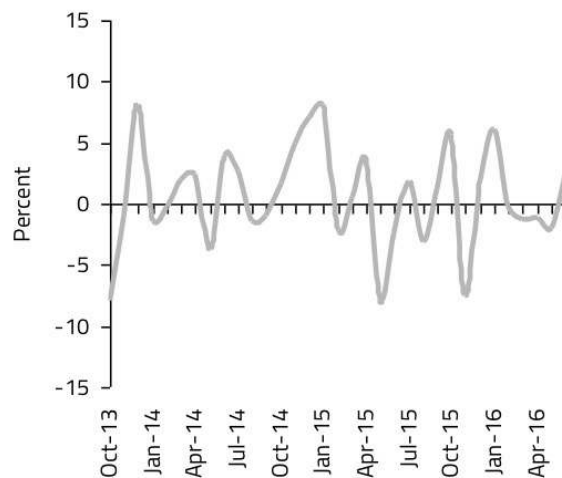
UM Monthly Growth Rate



CB Monthly Growth Rate



CCI Monthly Growth Rate



Source: Tower Street

Looking at all four indices calculated at a monthly rate, three takeaways emerge:

- The ESI is the least volatile index, providing more signal and less noise, resulting in better information for analysis.
- The CB Index exhibits a high level of variance with monthly growth rates that range from -10.25 to 10.9, the most extreme measures across all indices. This variance could signal real changes in the economy; however, analysis detailed later in the paper suggests the variance is more likely to be less signal and more noise.
- While more volatile than the ESI, the CCI is clustered around zero percent growth, more so than the UM and CB indices.

When Calculated On A Monthly Basis, The ESI Leads The UM Index

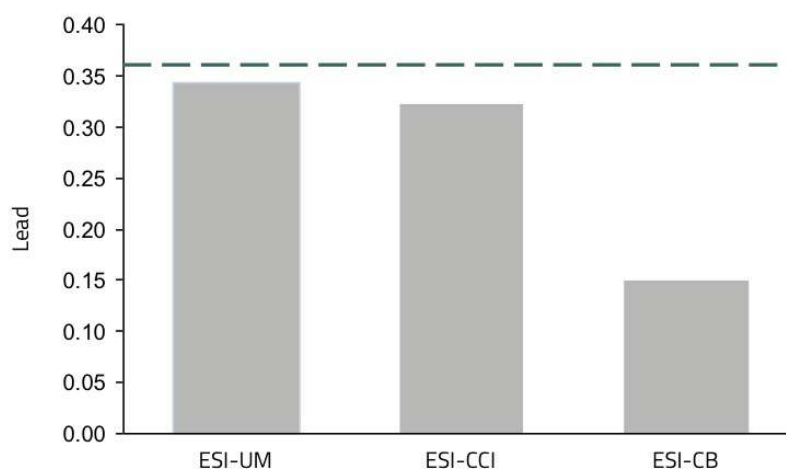
In a market with many competing consumer sentiment indices, leading other indices is an essential value so that policymakers and market participants are acting on the freshest data. Trading or adjusting policy thinking based on a lagging indicator is akin to dressing for rain because of yesterday's forecast, not this morning's. Two statistical tests show the ESI, when calculated on a monthly basis, leads the UM Index, while no other index leads the ESI.

First, cross-correlogram analysis, which depicts the leading and/or lagging relationship between two time series, suggests there is evidence that the ESI is a leading indicator among this group (Fig. 8).

Changes in the ESI lead changes in the UM Index both within the same month and in the next. In other words, if the ESI rises in January, then we would expect the UM Index to rise in January and February. The ESI appears to have some

Fig. 8 The ESI Leads The UM Index and CCI

Cross-Correlogram Result



Source: Tower Street

degree of a leading relationship at a one-month lag, though this relationship is statistically insignificant.

The second test, a Granger causality test, is used to further explore the notion that the ESI may be a leading indicator. Whereas the cross-correlogram looks at the relationship between the two time series, the Granger causality test indicates whether the ESI leads other indicators after controlling for that indicator's own history.

Many time series tend to have inertia, where past values are good predictors of future values. The Granger causality test controls for this inertia in each time series to see if there is a "deeper" leading relationship.

For example, the ESI may suggest that the next UM Index reading will be an increase, but if the UM Index has risen three consecutive readings in a row, then that prediction is less impressive. Therefore, the question is: if one controls for the UM Index's recent trends, then is the ESI still predictive? The result: The ESI is still a leading indicator.

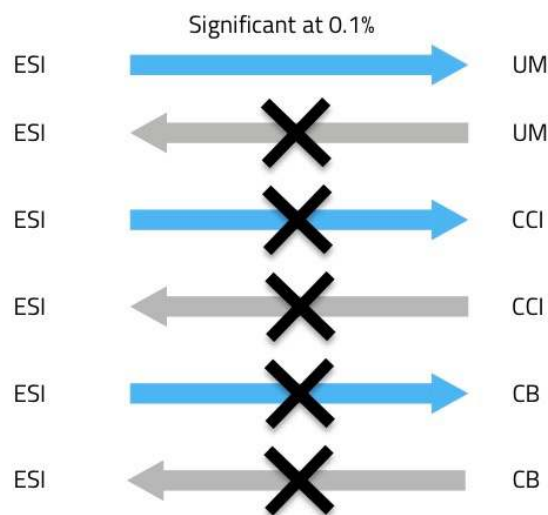
"The weekly ESI offers additional explanatory power for all three indicators above and beyond past performance."

The analysis reinforces the notion that the ESI leads the UM Index. In fact, the Granger causality test finds that ESI "Granger causes," or leads, the UM Index with a statistical significance at the 0.1 percent level. We do not find a statistically significant leading relationship between the ESI and the other indices. However, no index leads the ESI in either statistical test.

The ESI's Timing Advantage Offers Some Explanatory Power Over All Indicators

The main analysis above calculated all four indices on a monthly basis for a "fair" comparison to see if one indicator leads the others. However, the ESI is calculated more frequently. This analysis uses a newly developed statistical test to see whether the

Fig. 9 Granger Causality Test Finds The ESI Leads UM Index; Significant At 0.1 Percent



Source: Tower Street

ESI at a weekly rate can "explain" the UM and CB indices, as well as the CCI rolled up to a monthly rate. Developed by Eric Ghysels of the University of North Carolina at Chapel Hill, this test, known as a mixed-data sampling (MIDAS) regression analysis, is on the forefront of statistical methods.

The result: The weekly ESI offers additional explanatory power for all three indicators above and beyond past performance. The implication of this finding is that market participants and policymakers can rely upon the ESI calculated at higher frequencies to inform future UM, CB, and CCI releases.

The ESI Leads The CCI On A Weekly Basis

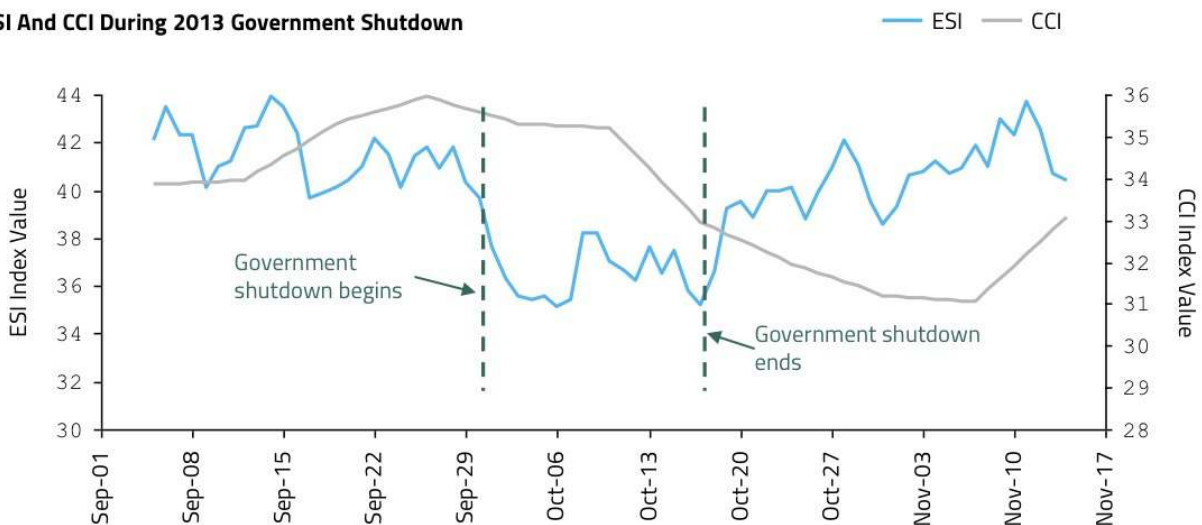
The CCI is the only competitor with a weekly release. However, the ESI still leads the CCI even when compared on a weekly basis. In fact, cross-correlogram analysis reveals the ESI leads the CCI at weekly lags up to three weeks. This relationship is statistically significant.

The ESI Reacts More Quickly To Macroeconomic Events

The above statistical analyses show the ESI leads other consumer confidence indices on average. But how does the ESI perform around specific events? Two recent experiences show that while the ESI may be the least volatile consumer sentiment index, it reacts most quickly to external events, providing more timely information for market participants and policymakers.

Fig. 10 The ESI Reacts Day Of To Government Shutdown Beginning And Ending

ESI And CCI During 2013 Government Shutdown



Source: Tower Street

“It appears that of the three competitors, the ESI leads the UM and CCI indices, with the former supported by strong statistical significance. These findings are reinforced by three sets of analyses ... Importantly, there is no evidence to suggest that any of the competitors lead the ESI.”

For example, from October 1 through 16, 2013, the U.S. government shut down, with 800,000 federal employees indefinitely furloughed as most operations were stopped. Standard & Poor's argued the shutdown would cost the U.S. economy \$24 billion, cutting 0.6 percent off of economic growth in the quarter.

One would expect to see a dip in consumer sentiment that corresponded to the economic uncertainty surrounding the government shutdown. Likewise, one

would expect a rebound as the shutdown came to an end. As seen in Fig. 10, the ESI captured this trough of economic sentiment within 24 hours, well before the CCI. Further, the ESI more quickly bounced back once the shutdown ended. In fact, the CCI did not register a significant decline until halfway through the shutdown, and reached its lowest point almost a month later.

Likewise, the UM Index hit its floor a day after the shutdown ended, and the CB Index ended its decline in the beginning of November, nearly two weeks after the shutdown ended.

Similarly, in response to Britain's referendum vote to leave the European Union in June 2016, the ESI immediately captured economic anxiety, as evidenced by its sharp decline. On the other hand, the CCI remained constant until a slight downturn more than a week after the vote.

These two examples highlight how the ESI is more responsive and more closely models consumer attitudes than other indices during market-moving events.

Conclusion To Section II

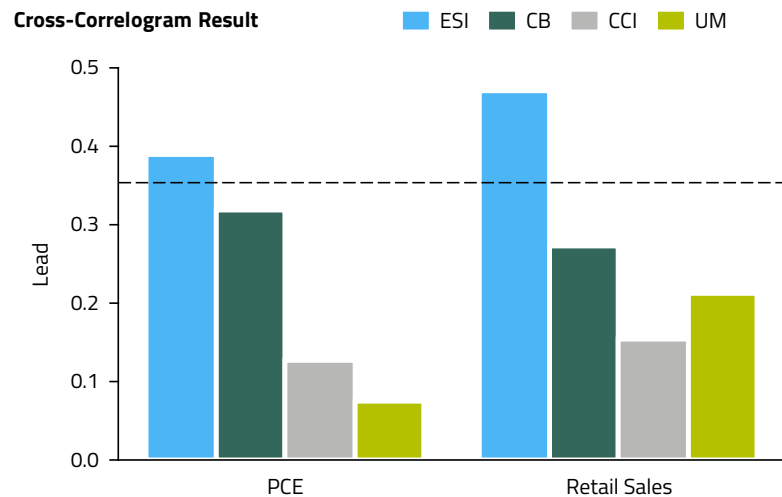
It appears that of the three competitors, the ESI leads the UM and CCI indices, with the former supported by strong statistical significance. These findings are reinforced by three sets of analyses: cross-correlogram analyses, Granger causality tests, and a MIDAS regression analysis. Importantly, there is no evidence to suggest that any of the competitors lead the ESI.

Test-driving the ESI with event studies further supports the notion that the ESI captures the impact of external events more quickly than its competitors and better distinguishes between the signal and the noise. The U.S. government shutdown and Brexit vote both highlighted that while the ESI may be the least volatile index over time, it's the most reactive to market-moving events.

III. The ESI Leads Consumer Spending

The ESI tends to lead other consumer sentiment indices, but it's not enough to lead the other indices if consumer sentiment is not predictive of macroeconomic outcomes.

Fig. 11 The ESI Leads PCE And Retail Sales On Three-Month Lag; Only Index With Significant Relationship



Source: Tower Street

This section assesses whether the ESI can explain and/or predict consumer behavior as measured by personal consumption expenditures (PCE) and retail sales. Explaining changes refers to correlating with contemporaneous changes, while predicting changes refers to correlating with future changes. Furthermore, like the above section, the analysis compares the ESI's explanatory power to the other indices.

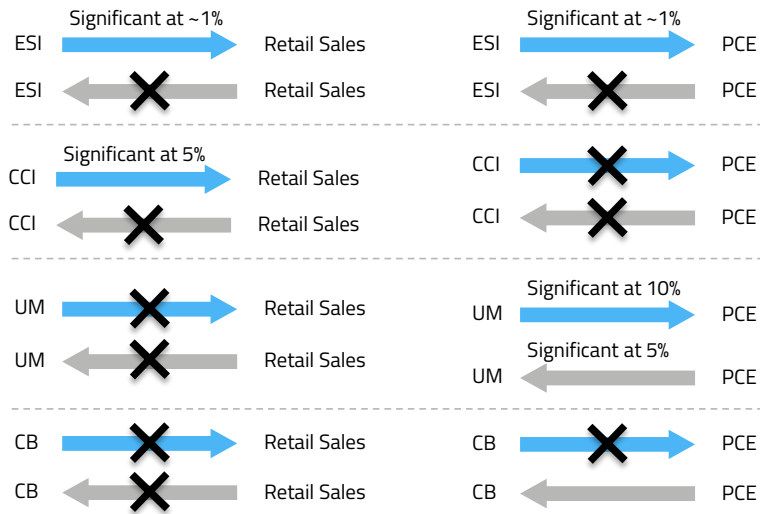
The result: unlike the other indices, the ESI significantly leads PCE and retail sales three months out. Therefore, a rise in the ESI would suggest PCE and retail sales will rise next quarter (Fig. 11).

Moreover, as detailed later in this section, when factoring in additional macroeconomic variables, the ESI retains more explanatory power of PCE and retail sales contemporaneously and on a two-month lag than the other indices.

“Moreover, when factoring in additional macroeconomic variables, the ESI retains more explanatory power of PCE and retail sales contemporaneously and on a two-month lag than the other indices.”

In fact, the ESI not only outperforms the other indices in explaining the headline retail sales numbers, but also the following disaggregated categories: Auto and Other Motor Vehicles; Food and Beverage Stores; Furniture and Home Furnishings Stores; Food Services and Drinking Places; Health and Personal Care Stores; Motor Vehicle and Parts Dealers; and Sporting Goods, Hobby, Book, and Music Stores. The remainder of this section provides more detail on the analysis driving these results.

Fig. 12 Granger Causality Test Finds The ESI Is The Only Index To Lead Both Retail Sales And PCE



Source: Tower Street

The ESI Leads PCE And Retail Sales Three Months Out

Similar to the index comparison analysis in Section I of this report, the ESI's (and other indices') relationship to PCE and retail sales is examined using both cross-correlograms and Granger causality tests.

Fig. 11 shows that based on a cross-correlogram analysis the ESI is once again the only measure of confidence that leads PCE and retail sales. In fact, the ESI is the only variable to have any significant explanatory power, which it does at three lags.

Therefore, a rise in the ESI suggests that PCE and retail sales are expected to rise in the next quarter.

A Granger causality test reinforces this conclusion (Fig. 12). The ESI leads PCE and retail sales. This relationship is statistically significant at the one percent level. Only Bloomberg's CCI has a similar ability to predict retail sales, though the ESI leads with greater confidence. Interestingly, the UM Index has an endogenous relationship with PCE – that is, PCE and the UM Index predict each other, an indication that some of the UM Index's explanatory power under more naive tests can be interpreted as a redundancy.

“A Granger causality test reinforces this conclusion ... the ESI is the only indicator to consistently lead both PCE and retail sales.”

The ESI is the only indicator to consistently lead both PCE and retail sales.

After Factoring In Macroeconomic Variables, ESI Outperforms In Predictive Ability

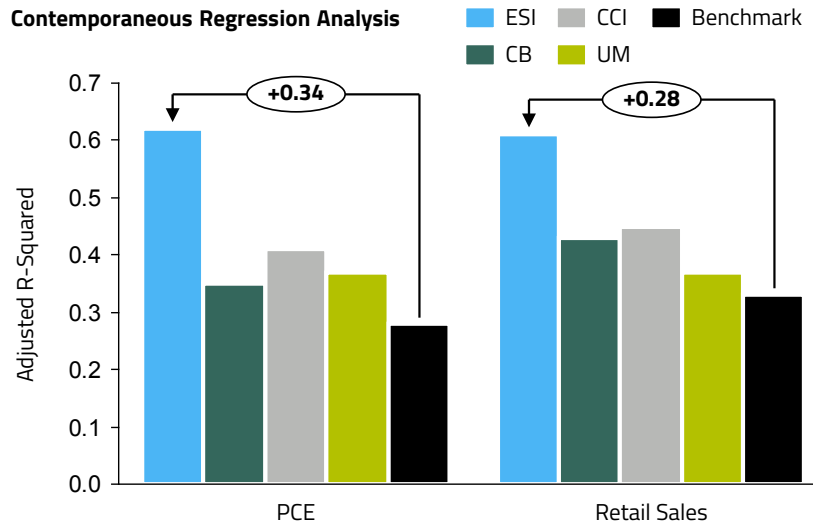
Many factors drive consumer spending. For a sentiment measure to be useful, it must retain explanatory power when combined with other macroeconomic control variables. A standard approach for modeling consumer behavior includes several variables. Consider the change in retail sales as the object of interest.

We begin with a standard macro model to serve as a benchmark. This benchmark model includes retail sales' own one-month lagged growth rate to capture natural persistence in the process. Moreover, the benchmark model includes real disposable personal income growth, S&P 500 returns, the 3-month U.S. Treasury Bill rate, and the unemployment rate.

To examine the role of the ESI, we augment the benchmark model to include a contemporaneous measure for the ESI, as well as two lags of

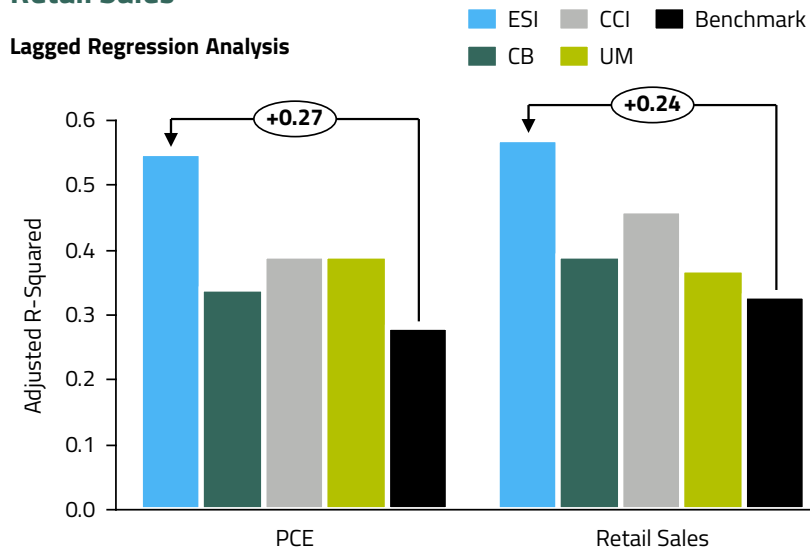
the ESI. Note that this analysis rolls all four indicators up to the monthly rate, includes the above described macroeconomic controls, and tests whether each indicator retains explanatory power on a contemporaneous basis and on a two-month lag.

Fig. 13 The Monthly ESI Explains Contemporaneous PCE And Retail Sales Better Than Other Indices



Source: Tower Street

Fig. 14 The Monthly ESI Is The Best Predictor Of PCE And Retail Sales



Source: Tower Street

As depicted in Fig. 13, the ESI enhanced model has an adjusted R-squared of 0.62, which is 0.34 above the benchmark model, and 0.21 above the benchmark model that uses the CCI instead of the ESI. For retail sales, the results are similar with the ESI model's adjusted R-squared equaling 0.61 compared to 0.33 for the benchmark model and 0.45 for the CCI model. It's noteworthy that the UM Index explains little beyond the benchmark model.

The implication is that after controlling for the other macroeconomic factors, the ESI adds the most explanatory power to that month's PCE and retail sales.

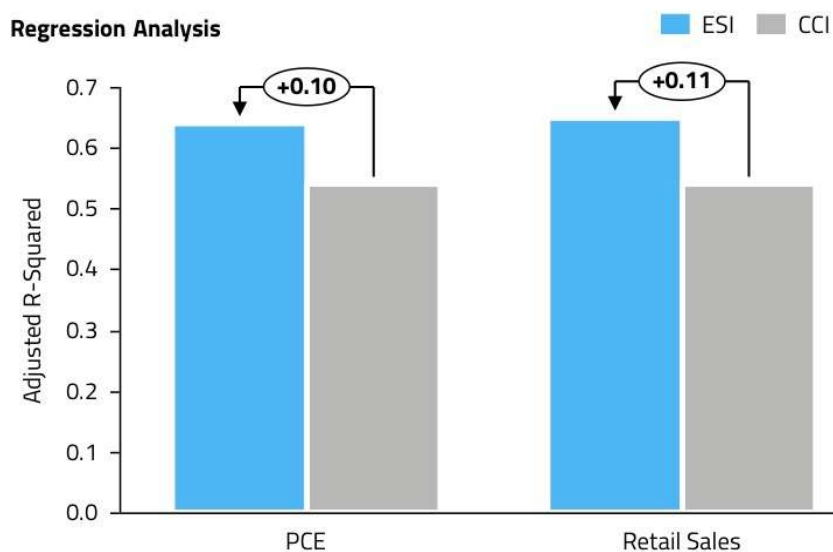
The same conclusion holds for PCE and retail sales two months out. In practice, investors and policymakers may want to forecast, rather than simply explain, consumer behavior. To facilitate this need, we drop the contemporaneous value of the ESI from the enhanced model, making it purely predictive. As Fig. 14 shows, the ESI retains the most explanatory power over the macro model. The CCI retains the second most explanatory power.

In sum, this analysis finds on both explanation and forecasting, the ESI best explains the trajectory of PCE and retail sales compared to other indices. Moreover, it adds explanatory value over the macroeconomic controls.

Once Again, The ESI's Strengths Are Improved When Adding In Its Time Advantage

The above analysis reflects the ESI calculated at a monthly rate. Using the same MIDAS regression analysis technique discussed earlier, one can test whether the ESI calculated at the weekly rate can explain PCE and retail sales at the monthly rate. The result - the ESI calculated at the weekly rate better explains PCE and retail sales than the ESI calculated at the monthly rate. For retail sales, the adjusted R-squared rises from 0.61 to 0.65. For PCE, it rises from 0.62 to 0.64.

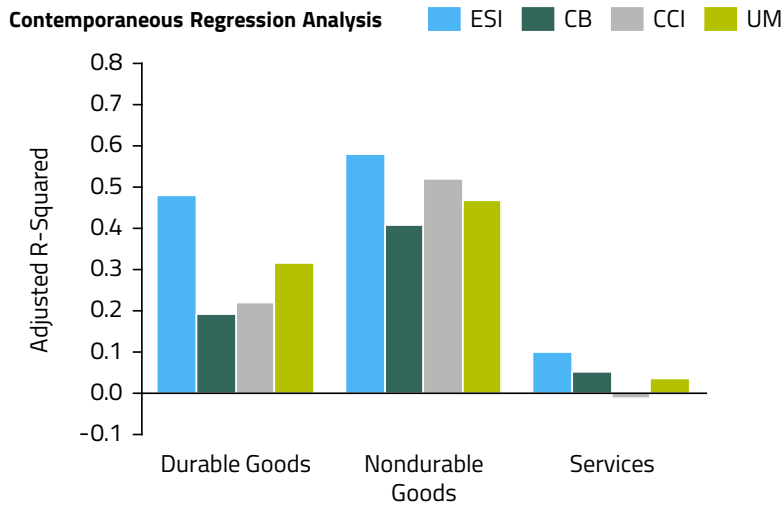
Fig. 15 The Weekly ESI Better Explains PCE And Retail Sales Than The Weekly CCI



Source: Tower Street

Additionally, similar to the results for the monthly ESI, the weekly frequency of the ESI also outperforms the CCI, as shown in Fig. 15.

Fig. 16 The ESI Explains The Components Of PCE Better Than Other Indices



Source: Tower Street

is strongest for nondurable goods. Further, no other index consistently performs across all subcomponents. The UM Index is second best for durable goods, but performs worse than the CCI on nondurable goods.

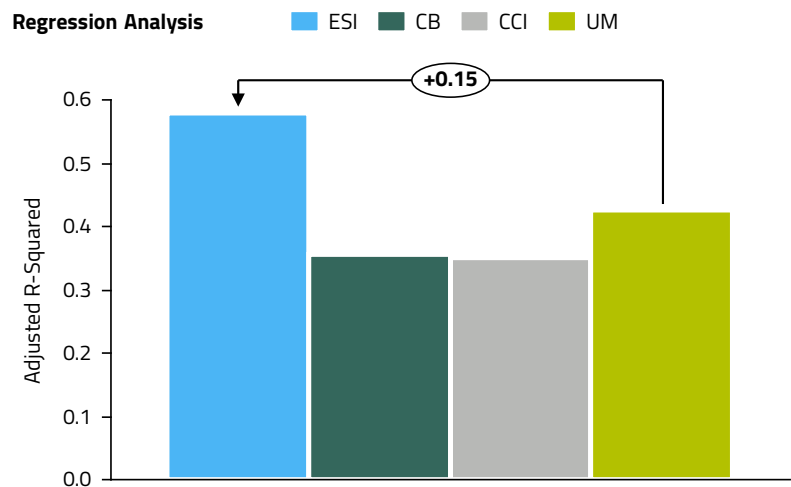
More interestingly, the ESI also outperforms other indicators with retail sales, which contains 19 subcomponents measuring food, clothing, merchandise, furniture, electronics, and motor vehicle sales, among others.

In particular, it has superior explanatory power across nine segments — including when compared to the macro model, which controls for the macroeconomic variables outlined above. The macro model does better on five segments. Meanwhile, the CCI outperforms the other indices and the macro model in four segments, and the CB Index does so for one. The UM Index does not outperform the ESI in any segment.

Explanatory Power Findings Apply To Subcomponents Of PCE And Retail Sales

Beyond the broader aggregates, the ESI also better predicts sectoral breakdowns within PCE and retail sales. PCE has three subcomponents: durable goods, nondurable goods, and services. Like in the above analysis, the ESI not only retains explanatory value when added to the benchmark model, it better explains each subcomponent’s growth than other indices (Fig. 16). In particular, its explanatory power

Fig. 17 The ESI Explains Auto And Other Motor Vehicles Better Than Other Indices

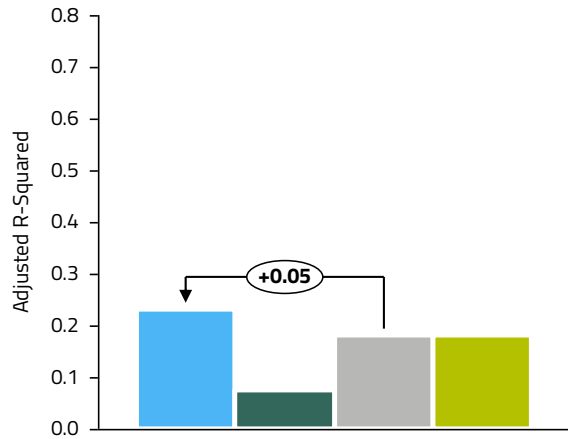


Source: Tower Street

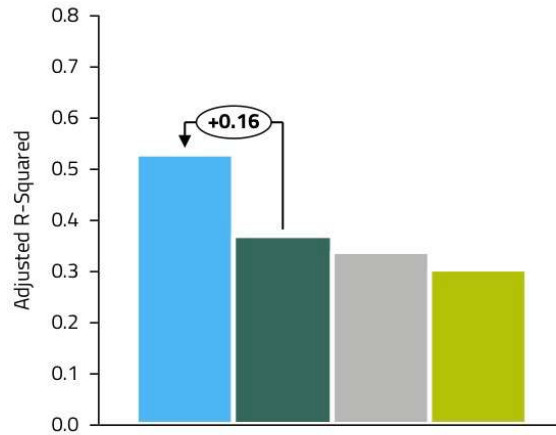
Fig. 18 Comparison By Retail Sales Categories

ESI CB CCI UM

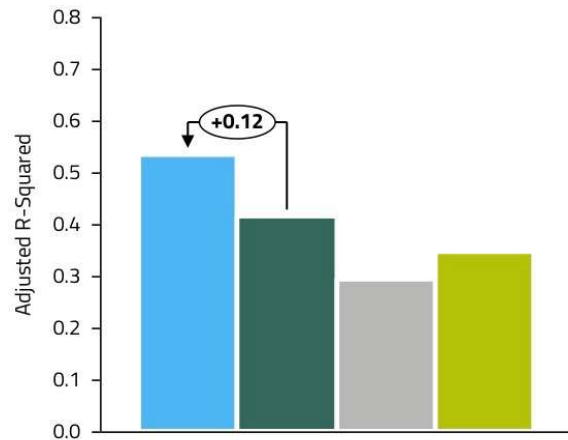
Food And Beverage Stores



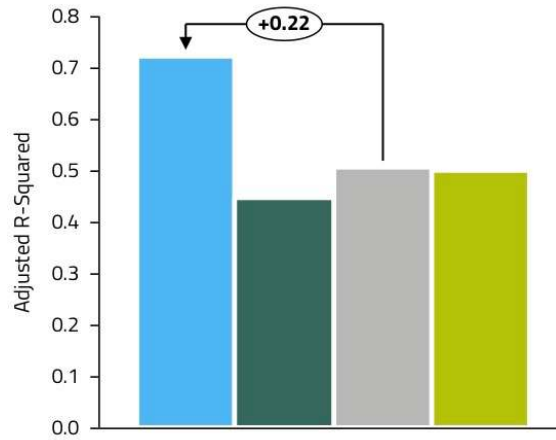
Food And Drinking Places



Home And Furnishing



Sporting Goods And Hobbies



Source: Tower Street

Of note, the ESI retains strong explanatory power for motor vehicle sales, with adjusted R-squared values well over 0.50 for both Auto and Other Motor Vehicles and Motor Vehicle and Parts Dealers (Fig. 17). This indicates the ESI’s capacity for explaining motor vehicles sales – outperforming even the UM Index.

Fig. 18 illustrates the ESI’s advantage over Food and Beverage Stores; Furniture and Home Furnishings Stores; Food Services and Drinking Places; and Sporting Goods, Hobby, Book, and Music Stores. Interestingly, the ESI is most well-suited for predicting sporting goods and hobby-related purchases.

Overall, the ESI consistently better explains PCE and retail sales growth, including the subcomponents.

Conclusion

A better understanding of consumers can lead to better decisions by market participants and policymakers. It's this need that drove the creation of the ESI, a real-time sentiment index that can be cross-tabulated by demographic, cultural, and other variables to best track consumer pulse.

This analysis sought to not only compare the ESI to other consumer sentiment indices, but to also measure whether it can explain economic outcomes, specifically PCE and retail sales.

The results are clear: The ESI provides the most timely and useful information compared to other indices. The ESI tends to lead other consumer sentiment indices, leading the UM Index up to a two-month lag. The ESI best explains PCE and retail sales, including their subcomponents.

Overall, this analysis shows that market participants and policymakers acting on ESI results will be using an index reflecting the most up-to-date consumer sentiment that best predicts real economic outcomes.

Fig. 19 The ESI Retains The Most Explanatory Power Across More Retail Sales Categories

Contemporaneous Regression Analysis (Results Reported Are Adjusted R-Squared)

Category	Benchmark Model	ESI	CB	CCI	UM
RSAFS	0.33	0.61	0.43	0.45	0.37
RSAOMV	0.37	0.58	0.36	0.35	0.43
RSBMGESD	0.01	-0.08	-0.01	-0.02	-0.05
RSCCAS	0.20	0.10	-0.01	0.03	-0.04
RSDBS	0.03	0.23	0.07	0.18	0.18
RSDSELD	0.56	0.53	0.56	0.53	0.50
RSEAS	-0.12	-0.13	-0.19	-0.23	-0.20
RSFHFS	0.31	0.54	0.42	0.29	0.35
RSFSDP	0.15	0.53	0.37	0.34	0.30
RSFSXMV	0.15	0.39	0.35	0.49	0.13
RSGASS	0.02	0.37	0.04	0.41	0.02
RSGCS	0.07	0.20	0.14	0.23	0.17
RSGMS	0.46	0.47	0.50	0.43	0.41
RSHPCS	0.07	0.12	-0.04	-0.02	-0.06
RSMSR	0.12	0.09	0.05	0.08	0.10
RSMVPD	0.36	0.58	0.36	0.36	0.42
RSNSR	0.15	0.17	0.07	0.21	0.05
RSSGHBMS	0.43	0.72	0.45	0.51	0.50
RSXFES	0.28	0.54	0.34	0.45	0.35

Source: Tower Street

Key:

- RSAFS Retail and Food Services Sales
- RSFSXMV Retail Sales and Food Services Excluding Motor Vehicles and Parts Dealers
- RSAOMV Retail Trade: Auto and Other Motor Vehicles
- RSBMGESD Retail Trade: Building Materials, Garden Equipment and Supplies Dealers
- RSCCAS Retail Trade: Clothing and Clothing Accessory Stores
- RSDBS Retail Trade: Food and Beverage Stores
- RSDSELD Retail Trade: Department Stores (Excluding Leased Departments)
- RSEAS Retail Trade: Electronics and Appliance Stores
- RSFHFS Retail Trade: Furniture and Home Furnishings Stores
- RSFSDP Retail Trade: Food Services and Drinking Places
- RSGASS Retail Trade: Gasoline Stations
- RSGCS Retail Trade: Grocery Stores
- RSGMS Retail Trade: General Merchandise Stores
- RSHPCS Retail Trade: Health and Personal Care Stores
- RSMSR Retail Trade: Miscellaneous Store Retailers
- RSMVPD Retail Trade: Motor Vehicle and Parts Dealers
- RSNSR Retail Trade: Nonstore Retailers
- RSSGHBMS Retail Trade: Sporting Goods, Hobby, Book, and Music Stores
- RSXFES Retail Sales: Total (Excluding Food Services)

Appendix

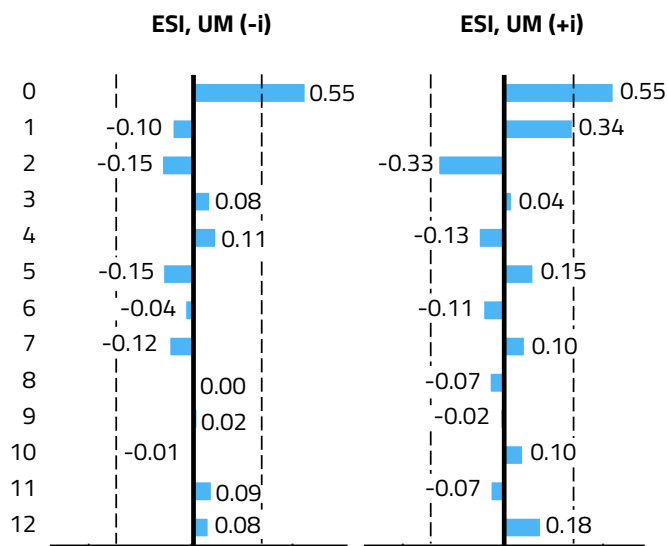
Appendix 1: Pairwise Granger Causality Tests

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CB does not Granger Cause ESI	31	0.45504	0.6394
ESI does not Granger Cause CB		1.42063	0.2597
CCI does not Granger Cause ESI	31	0.13887	0.8710
ESI does not Granger Cause CCI		2.29071	0.1213
UM does not Granger Cause ESI	31	0.07229	0.9304
ESI does not Granger Cause UM		14.0299	7.E-05
CCI does not Granger Cause CB	31	0.40535	0.6709
CB does not Granger Cause CCI		1.04546	0.3658
UM does not Granger Cause CB	31	2.41082	0.1095
CB does not Granger Cause UM		0.98464	0.3871
UM does not Granger Cause CCI	31	1.04580	0.3657
CCI does not Granger Cause UM		0.41373	0.6655

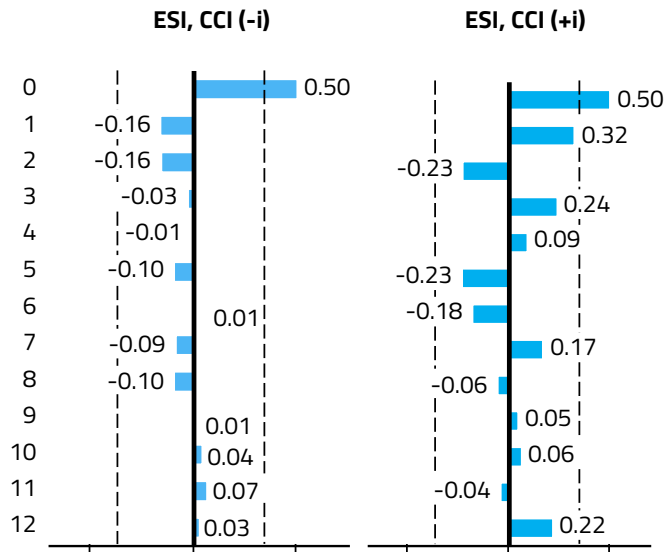
Source: Tower Street

Appendix 2: Does ESI Lead UM?



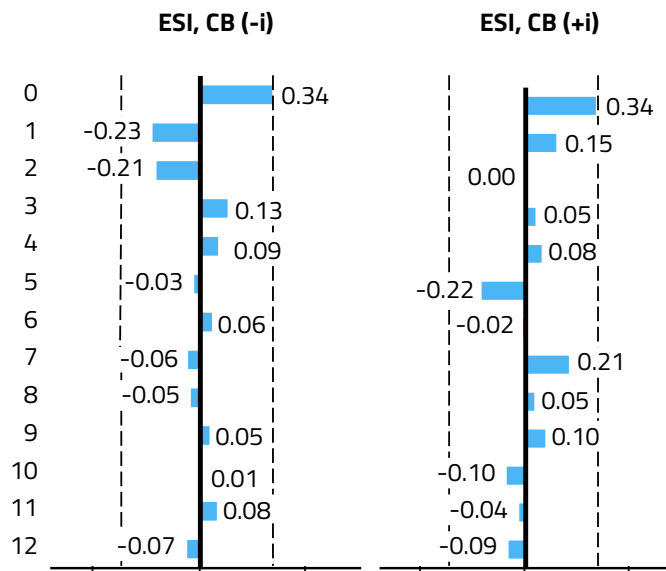
Source: Tower Street

Appendix 3: Does ESI Lead CCI?



Source: Tower Street

Appendix 4: Does ESI Lead CB?



Source: Tower Street

Appendix 5: Pairwise Granger Causality Tests

	ESI	CCI	CB	UM	RSAFS	PCE
ESI	1.00					
CCI	0.51	1.00				
CB	0.37	0.35	1.00			
UM	0.54	0.52	0.23	1.00		
RSAFS	0.04	-0.09	0.01	-0.16	1.00	
PCE	0.15	-0.14	-0.04	-0.08	0.77	1.00

Source: Tower Street

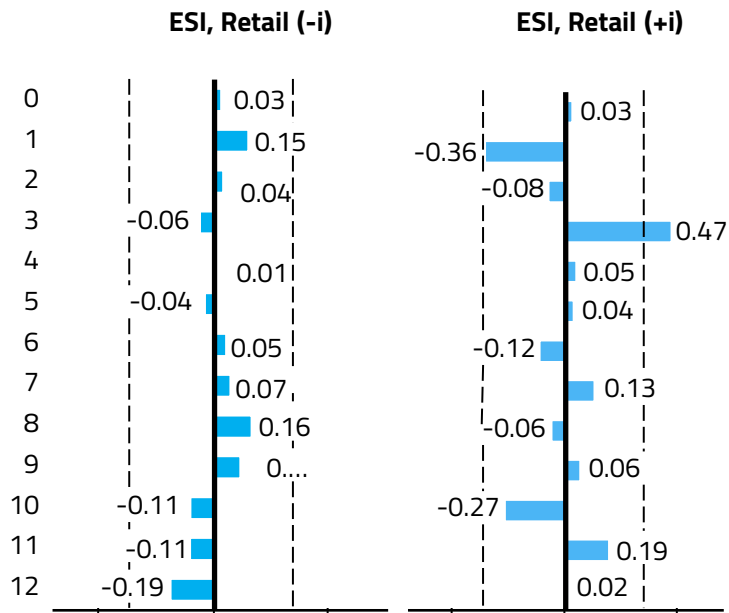
Appendix 6: Pairwise Granger Causality Tests

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
ESI does not Granger Cause RSAFS	31	4.69809	0.0181
RSAFS does not Granger Cause ESI		0.02350	0.9768
CB does not Granger Cause RSAFS	31	0.95273	0.3987
RSAFS does not Granger Cause CB		0.19332	0.8254
CCI does not Granger Cause RSAFS	31	3.47709	0.0459
RSAFS does not Granger Cause CCI		0.20556	0.8155
UM does not Granger Cause RSAFS	31	2.13876	0.1381
RSAFS does not Granger Cause UM		0.92353	0.4098

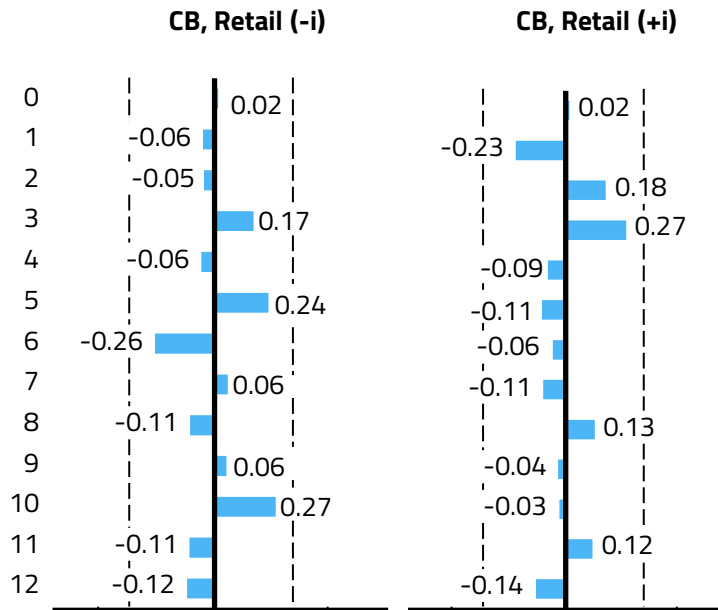
Source: Tower Street

Appendix 7: Does ESI Lead Retail?



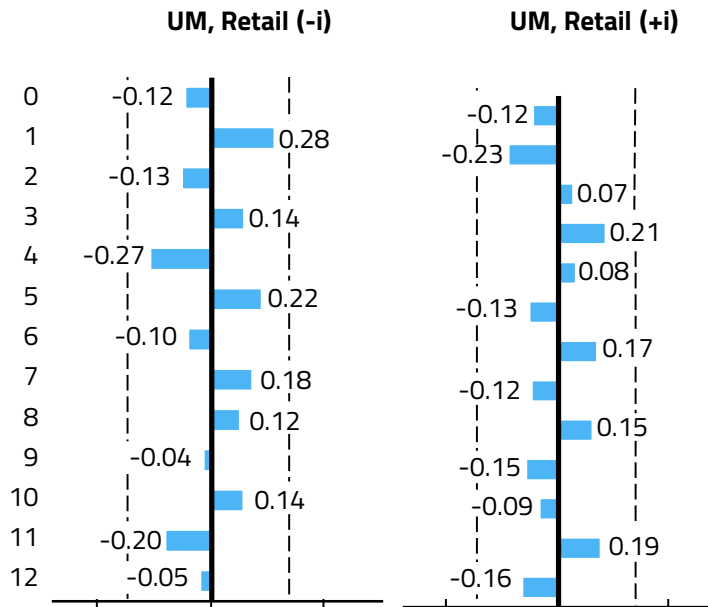
Source: Tower Street

Appendix 8: Does CB Lead Retail?



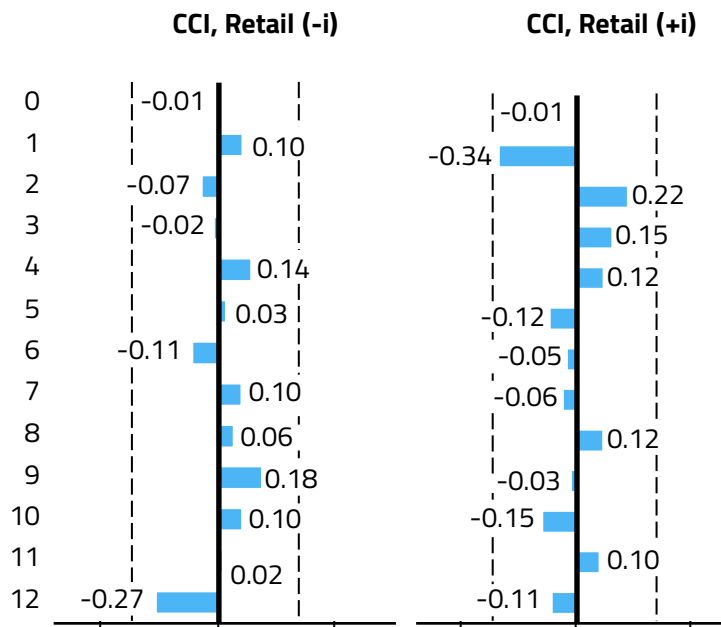
Source: Tower Street

Appendix 9: Does UM Lead Retail?



Source: Tower Street

Appendix 10: Does CCI Lead Retail?



Source: Tower Street

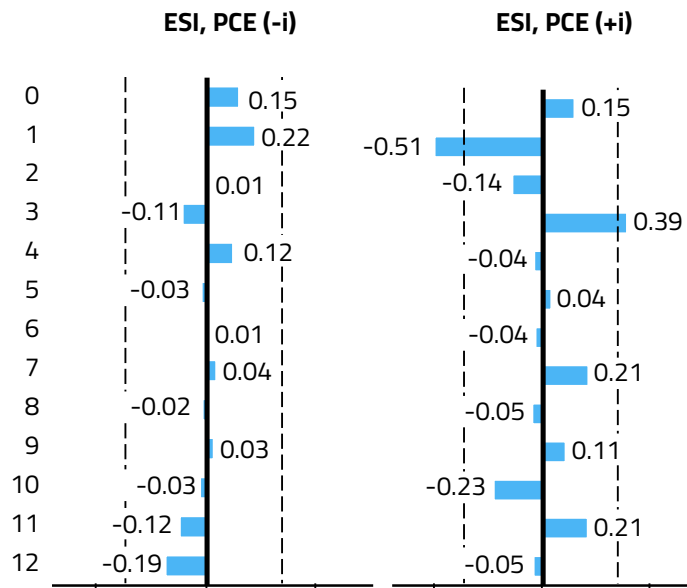
Appendix 11: Pairwise Granger Causality Tests

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
ESI does not Granger Cause PCE	30	5.12552	0.0136
PCE does not Granger Cause ESI		0.17341	0.8418
CB does not Granger Cause PCE	30	0.66000	0.5256
PCE does not Granger Cause CB		0.00928	0.9908
CCI does not Granger Cause PCE	30	1.62591	0.2169
PCE does not Granger Cause CCI		0.05544	0.9462
UM does not Granger Cause PCE	30	2.70768	0.0862
PCE does not Granger Cause UM		4.55013	0.0206

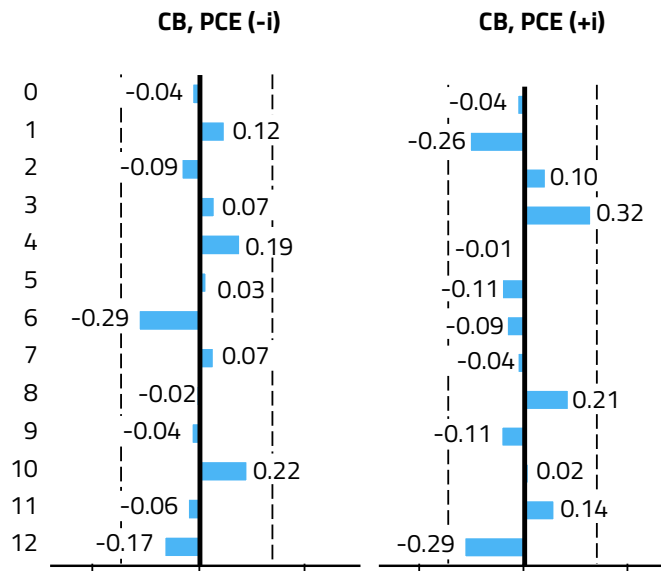
Source: Tower Street

Appendix 12: Does ESI Lead PCE?



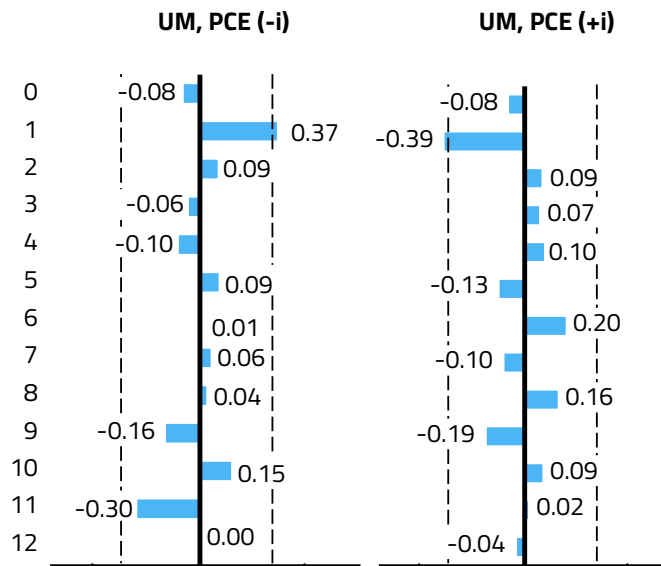
Source: Tower Street

Appendix 13: Does CB Lead PCE?



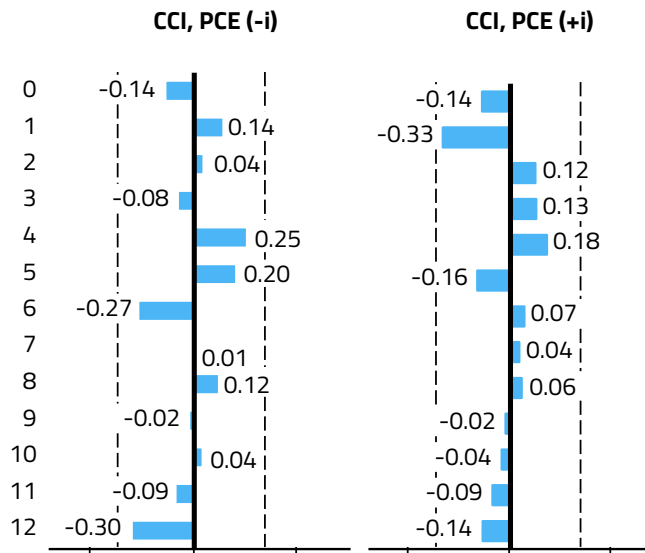
Source: Tower Street

Appendix 14: Does UM Lead PCE?



Source: Tower Street

Appendix 15: Does CCI Lead PCE?



Source: Tower Street

Appendix 16: Can ESI Explain/Forecast Retail Sales?

Index	Lags Only	Contemporaneous
Baseline Model		0.33
ESI	0.57	0.61
ESI - NJ	0.48	0.50
ESI - E	0.57	0.61
ESI - MP	0.47	0.45
ESI - PF	0.41	0.39
ESI - NH	0.40	0.38
CCI	0.46	0.45
CB	0.39	0.43
UM	0.37	0.37

Source: Tower Street

Appendix 17: Can ESI Explain/Forecast PCE?

Index	Lags Only	Contemporaneous
Baseline Model		0.33
ESI	0.57	0.61
ESI - NJ	0.48	0.50
ESI - E	0.57	0.61
ESI - MP	0.47	0.45
ESI - PF	0.41	0.39
ESI - NH	0.40	0.38
CCI	0.46	0.45
CB	0.39	0.43
UM	0.37	0.37

Source: Tower Street

Appendix 18: Can ESI Explain/Forecast Retail Sales?

Index	Adj. R2
Baseline Model	0.33
ESI (Monthly)	0.61
ESI (Weekly)	0.65
CCI (Monthly)	0.45
CCI (Weekly)	0.54
CB	0.43
UM	0.37

Source: Tower Street

Appendix 19: Can ESI Explain/Forecast PCE?

Index	Adj. R2
Baseline Model	0.33
ESI (Monthly)	0.61
ESI (Weekly)	0.65
CCI (Monthly)	0.45
CCI (Weekly)	0.54
CB	0.43
UM	0.37

Source: Tower Street