A Deeper Analysis of the Performance of SmartEstimates and Predicted Surprise

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Abstract

We investigate the performance of the StarMine® SmartEstimates® and Predicted Surprise for earnings per share in the United States from 1998 to 2018. We examine overall, negative and positive surprises for forward one year and forward one quarter forecast periods. We compare the Predicted Surprise with a baseline Revisions Momentum prediction based on the direction of a 30-day consensus change measure and verify that the Predicted Surprise provides superior performance. We find that the Predicted Surprises taken together with corroborating consensus revisions have a considerably higher success rate than the baseline Revisions Momentum model by itself, with the biggest gains being for negative surprises. We also investigate the Predicted Surprise success rate depending on the magnitude of the surprise signal, market capitalization, sector and number of analysts covering the stock. Finally, we study the error of the consensus and SmartEstimates independent of the Predicted Surprise magnitude and find that the SmartEstimates provide a better performance when compared with the consensus for all surprise types.

1. Introduction

In a recent publication[1], we presented an updated version of the 2009 StarMine white paper: SmartEstimates and Predicted

Surprise: Construction and Accuracy[2]. Those papers examined the accuracy of the SmartEstimate when compared with the consensus, concentrating on the success rate of the signal in predicting the direction of the actual earnings surprises. Our main finding was that StarMine SmartEstimates continue to be more accurate than the consensus estimates across regions and financial measures, and that when the SmartEstimates differ from the consensus by 2% or more, the SmartEstimates correctly predict the sign of the earnings surprises 66% of the time. In another recent publication[3], we showed how SmartEstimates can be used to help predict and avoid earnings misses.

Those previous studies investigated aggregate performance on forward 1-year (FY1) predictions. They ran first-half/second-half studies and explored regional and sector breakouts, finding that the results are robust across time, industry and geography. What those studies did not examine was a more detailed breakout of the performance that might be relevant to different investment horizons and trading strategies.

In this study, we address some of those questions. Specifically, how do SmartEstimates and Predicted Surprise forecasts compare with a baseline model for both FY1 and FQ1 forecast periods? Where do they add the most value? Are positive Predicted Surprises more accurate than negative? Should we trust SmartEstimates more when there are more analysts?

We compare the results of a baseline analyst revision model[4-7], which is based on a momentum only strategy, with the SmartEstimates, for the overall, positive and negative surprises for annual and quarterly reports. We start by studying the success rate of predicting earnings surprises, comparing our baseline method to the Predicted Surprise. In addition to examining the overall success rates for FY1 and FQ1 forecasts, we examine the success rates for positive and negative predictions. We then present a detailed analysis of the Predicted Surprise success rate for different Predicted Surprise magnitude, market capitalization, sectors and number of analysts covering the stock. To complete our study, we investigate the consensus and SmartEstimates error metrics irrespective of the Predicted Surprise magnitude and show that the SmartEstimates perform better than the consensus. Since quarterly reports coverage is not large in other regions, we limit our study to the United States. Our analysis utilizes estimates for the then-current fiscal year (FY1) and then-current fiscal quarter (FQ1) periods for Earnings per Share (EPS). We use a universe of 3,000 securities with the largest market capitalization. Market capitalizations were resampled each year to avoid look ahead and survivorship bias. The period under study is from January 1998 until June 2018.

The remainder of the paper is organized as follows: In section two, we examine whether Predicted Surprises predict the direction of actual earnings surprises and compare the results with the baseline consensus revision approach. In section three, we investigate the improvement of the SmartEstimates in comparison with the consensus when the Predicted Surprise value is not taken into consideration. The conclusions are in section four and are followed by the Appendix, where we present the counts of tables 1-4.

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2. Predicted Surprise Accuracy

It has been known for several decades that analyst revisions are autocorrelated, that is, past analysts' revisions are correlated with future revisions[4-7]. We benchmark the success rate of the surprise prediction sign using a simple baseline "Revision Momentum" strategy based on this phenomenon. Consensus revisions are measured with respect to 30 days prior and are computed at every month end throughout the entire fiscal period. If the revision is upwards from one month end to the next and the surprise is positive (i.e., the actual is greater than the consensus of the previous end-of-month period), then we count that as a success or "hit," and vice versa, if the revision is downwards from one month end to the next and the surprise is negative (i.e., the actual is less than the consensus of the previous end-of-month period), that is also a success or "hit."

The results of this Revisions Momentum strategy are presented on the second column of Table 1. We observe that the success rate of this strategy is lower for negative surprises than for positive ones.

The goal of the SmartEstimate is to improve on consensus numbers, and from the SmartEstimates we calculate the Predicted Surprise, which is defined as the percent difference between the SmartEstimate and the consensus. We adjust for small consensus numbers in the denominator by placing a lower bound, or minimum divisor, on the absolute value of the consensus.

$$Predicted\ Surprise = \frac{SmartEstimate - Consensus}{Max(min\ divisor, |Consensus|)}$$

We examine the Predicted Surprise at every month end throughout the entire fiscal period in our analysis when the Predicted Surprise has magnitude of 2% or larger. When Predicted Surprises are accompanied by revisions to the consensus of the same sign, i.e., positive (negative) Predicted Surprises accompanied by an upwards (downwards) revision to the consensus estimate, the surprise prediction success rate is considerably higher than the case of the Revisions Momentum alone or of Predicted Surprise alone. We see that the biggest gains of this corroborating revisions approach when compared with the Revisions Momentum alone are for negative surprises, where there is a performance gain of 13% for both annual and quarterly reports, as shown in Table 1. We also observe that the success rate for Predicted Surprise alone is larger in annual reports for negative surprises than for positive ones, which is not seen in the Revisions Momentum strategy.

TABLE 1.

The earnings surprise prediction success rate for four strategies: Revisions Momentum alone; Predicted Surprise when Revisions Momentum agrees with the surprise direction; Predicted Surprise when Revisions Momentum disagrees; and Predicted Surprise alone. Revisions Momentum is the direction of the 30-day analyst consensus change. Predicted Surprise is the SmartEstimates-based value defined in section 2.

FY1:

SURPRISE TYPE	REVISIONS MOMENTUM BY ITSELF	PREDICTED SURPRISE AGREES WITH REVISIONS MOMENTUM	PREDICTED SURPRISE DISAGREES WITH REVISION MOMENTUM	PREDICTED SURPRISE BY ITSELF
Overall	68%	76%	50%	65%
Negative	65%	78%	55%	69%
Positive	70%	72%	45%	60%

FQ1:

SURPRISE TYPE	REVISIONS MOMENTUM BY ITSELF	PREDICTED SURPRISE AGREES WITH REVISIONS MOMENTUM	PREDICTED SURPRISE DISAGREES WITH REVISION MOMENTUM	PREDICTED SURPRISE BY ITSELF
Overall	62%	70%	51%	60%
Negative	53%	66%	45%	55%
Positive	76%	77%	56%	66%

We also study the success rate of the direction of the surprise based on the magnitude of the Predicted Surprise. As shown in Table 2, for the overall statistics and for negative surprises we find that the larger the magnitude of the signal, the larger is the Predicted Surprise success rate. Interestingly and counterintuitively, for positive FQ1 surprises, the success rate decreases as the magnitude of the signal increases, however, this may be due to a smaller sample size as shown in the Appendix.

TABLE 2.

The percent of cases in which the Predicted Surprise correctly anticipated the direction of FY1 and FQ1 earnings surprises, as a function of the magnitude of the signal.

FY1:

SURPRISE TYPE	2% to 5%	5% to 10%	10% to 20%	>20%
OVERALL	63%	66%	68%	72%
NEGATIVE	66%	70%	73%	78%
POSITIVE	60%	59%	59%	59%

FQ1:

SURPRISE TYPE	2% to 5%	5% to 10%	10% to 20%	>20%
OVERALL	58%	61%	64%	68%
NEGATIVE	50%	58%	64%	72%
POSITIVE	67%	65%	63%	61%

The ability of the Predicted Surprise to correctly predict the direction of the actual earnings surprises for different market capitalization and economic sectors is shown in Table 3. Significant Predicted Surprises (≥ 2% in magnitude) accurately predict the direction of overall earnings surprises at least 57% of the time and the model is more accurate for large capitalization stocks. Predicted Surprise hit rates are generally similar across sectors for FY1 predictions, ranging from 63% to 67%, with a little more variance seen in FQ1 predictions.

TABLE 3.

The earnings surprise prediction success rate for negative and positive surprises by market capitalization, and sector for Predicted Surprises with a magnitude ≥ 2%. Capitalization breakouts are the following: Large (Top 500), Mid (Next 500), Small (Next 2,000).

FY1:

MARKET CAPITALIZATION	OVERALL SURPRISES	NEGATIVE SURPRISES	POSITIVE SURPRISES
Large	67%	70%	63%
Mid	66%	69%	62%
Small	64%	69%	58%

FQ1:

MARKET CAPITALIZATION	OVERALL SURPRISES	NEGATIVE SURPRISES	POSITIVE SURPRISES
Large	65%	59%	72%
Mid	61%	55%	69%
Small	59%	55%	64%

FY1:

ECONOMIC SECTOR	OVERALL SURPRISES	NEGATIVE SURPRISES	POSITIVE SURPRISES
Energy	65%	71%	59%
Basic Materials	67%	76%	54%
Industrials	67%	71%	60%
Consumer Cyclicals	66%	71%	58%
Consumer Non-Cyclicals	65%	73%	53%
Financials	64%	65%	62%
Healthcare	63%	62%	64%
Technology	63%	62%	64%
Telecommunications Services	64%	68%	56%
Utilities	64%	66%	61%

FQ1:

ECONOMIC SECTOR	OVERALL SURPRISES	NEGATIVE SURPRISES	POSITIVE SURPRISES
Energy	63%	64%	63%
Basic Materials	61%	61%	60%
Industrials	59%	54%	66%
Consumer Cyclicals	61%	54%	69%
Consumer Non-Cyclicals	57%	53%	62%
Financials	59%	56%	63%
Healthcare	58%	48%	68%
Technology	60%	46%	75%
Telecommunications Services	58%	57%	59%
Utilities	57%	55%	58%

We find that the Predicted Surprise has a success rate that depends on the number of analysts covering the stock, as shown in Table 4. The general trend is that the greater the number of analysts, the higher the success rate, with the exception of negative surprises when there are more than 10 analysts.

The FY1 and FQ1 surprise prediction success rate by number N of active analysts covering the stock. Success rates shown are for significant Predicted Surprises (i.e., with magnitude ≥ 2%).

FY1:

SURPRISE TYPE	0 < N ≤ 2	2 < N ≤ 5	5 < N ≤ 10	N > 10
OVERALL	62%	65%	67%	67%
NEGATIVE	66%	70%	72%	68%
POSITIVE	56%	59%	61%	66%

FQ1:

SURPRISE TYPE	0 < N ≤ 2	2 < N ≤ 5	5 < N ≤ 10	N > 10
OVERALL	57%	60%	62%	64%
NEGATIVE	54%	56%	57%	55%
POSITIVE	61%	65%	69%	74%

3. SmartEstimate Accuracy

We also study the performance of SmartEstimates when compared with the consensus and how it relates to the sign of the Predicted Surprise (independent of the Predicted Surprise magnitude). In Table 5, we display the median error of the SmartEstimate and the consensus estimate for FY1 and FQ1. The error metrics in Table 1 were obtained by comparing the reported EPS actual with the EPS estimate every month end throughout the entire fiscal period. To measure the typical magnitude of error, we calculate the median absolute error of the consensus and SmartEstimate relative to the actual reported value. These results show that the biggest improvements of the SmartEstimate are for negative surprises, where an improvement of around 5% is seen for annual and quarterly reports.

TABLE 5.
Comparison of median absolute error of the consensus estimate and the SmartEstimate for FY1 and FQ1. We also show the percent improvement in the median absolute error obtained with the SmartEstimate. The SmartEstimate has a smaller median absolute error than the consensus for all surprise types.

FY1:

SURPRISE TYPE	Median Absolute Consensus Error[a]	Median Absolute SmartEstimate Error[a]	Improvement with SmartEstimate[b]	N >10
OVERALL	6.9%	6.7%	2.9%	67%
NEGATIVE	10.8%	10.3%	4.9%	68%
POSITIVE	5.2%	5.1%	2.4%	66%

FQ1:

SURPRISE TYPE	Median Absolute Consensus Error[a]	Median Absolute SmartEstimate Error[a]	Improvement with SmartEstimate[b]	N >10
OVERALL	10.1%	10.0%	1.0%	64%
NEGATIVE	14.5%	13.8%	5.3%	55%
POSITIVE	9.4%	9.4%	0.4%	74%

a We define the median absolute error as the median of |(Consensus − Actual)|/max(min divisor, |Actual|) or |(SmartEstimate − Actual)|/max(min divisor, |Actual|) respectively for columns 2 and 3.

b We define the Improvement with SmartEstimate as the percent difference between the median absolute consensus error and the median absolute SmartEstimate error.

Another question we explore is whether there is a seasonality component to estimate accuracy: Are consensus or SmartEstimates more reliable at different points in a company's fiscal year? In Figure 1, we show how the error metrics vary depending on the quarter in consideration when compared with the date of the annual report. Q4 is the quarter that coincides with the release of the annual report. The negative surprises have the largest improvement with SmartEstimate and it increases from one quarter to the next, showing a pattern of seasonality.

FIGURE 1.

Comparison of median absolute error of the consensus estimate (solid) and the SmartEstimate (dashed) for FQ1 for different quarters when measured with respect to the date of the annual report for overall (black), negative (red) and positive (blue) surprises. We also show the percent improvement in the median absolute error obtained with the SmartEstimate.
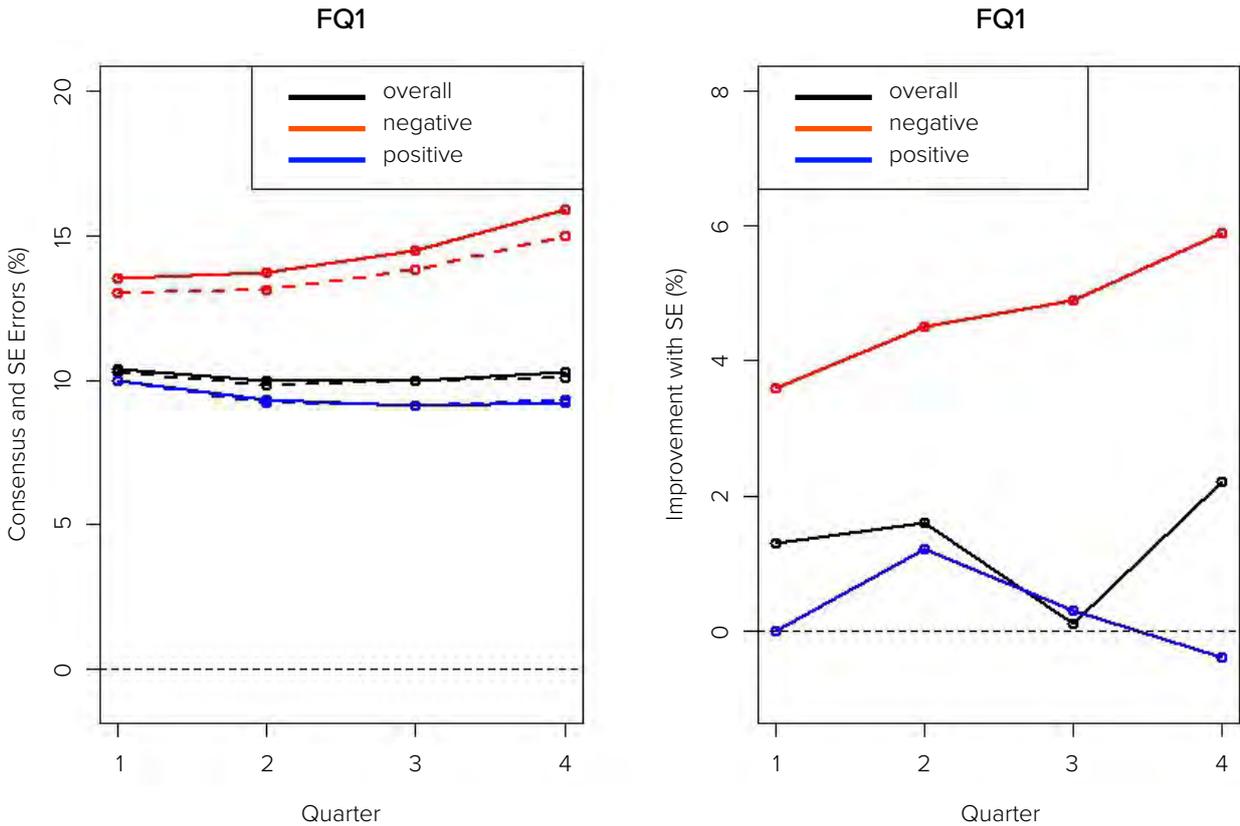

In Figure 2, we show the results of the evolution of the consensus and SmartEstimate errors as well as the improvement of the SmartEstimates when the date of the report approaches. We observe that the error decreases as the date of the report approaches, except at the very last month where a sudden increase in the error is observed. A possible explanation for this phenomenon is the empirical evidence of an upward management by firms of reported earnings and downward "management" of analysts' forecasts to achieve zero and small positive earnings surprises, as reported by Burgstahler and Eames[8].

Consensus (solid) and SmartEstimate (SE) (dashed) errors for the overall (black), negative (red) and positive (blue) surprises for FY1 and FQ1.
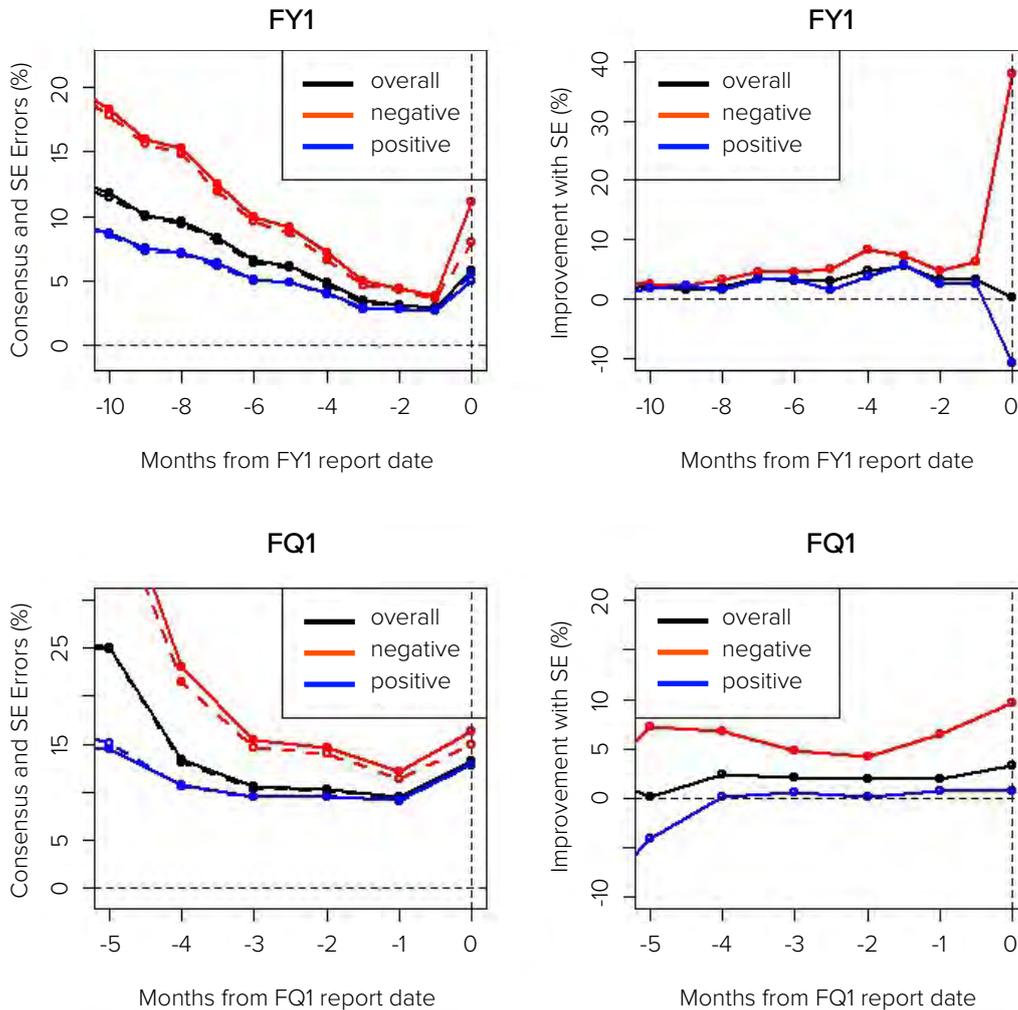
4. Conclusions

We studied the SmartEstimate performance across the period of January 1998 to June 2018 for overall, negative and positive surprises, for annual and quarterly reports and compared the results with those of the Revisions Momentum strategy. When the EPS SmartEstimate differs from the consensus estimate by 2% or more and corroborating revisions occur, the Predicted Surprise success rate for the direction of the actual surprise is 76% and 70% for annual and quarterly reports, respectively, which is considerably larger than the respective values of 68% and 62% for the baseline Revisions Momentum strategy. The biggest contributors for this difference are the negative surprises, with SmartEstimates substantially improving performance by a difference of 13%, for both annual and quarterly reports. Our studies showed that the higher the magnitude of the surprise signal, the higher the success rate for the overall and negative surprises, and that, with few exceptions, the higher the market capitalization and the number of analysts covering the stock, the higher is the success rate of the SmartEstimates. In the final section of our study, we showed that SmartEstimates perform better than the consensus with respect to error metrics, independent of the Predicted Surprise magnitude.

In terms of how these findings help investors, there are some interesting takeaways:

- Predicted Surprises add significant value to a baseline Revisions Momentum approach at predicting the direction of actual surprises
- Predicted Surprises are particularly additive when they predict negative surprises
- Predicted Surprises are more accurate for large companies than small
- The more analyst estimates that go into a Predicted Surprise, the more accurate it is – with the possible exception of negative FY1 predictions, though the variance in that case might be due to fewer observations
- The bigger the magnitude of the Predicted Surprise, the more accurate it is – except for positive FQ1 predictions
- SmartEstimates consistently improve on consensus estimates across forecast periods
- FQ1 estimate accuracy shows seasonality for negative surprises for both consensus and SmartEstimates

5. References

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6. Appendix

Here we present the number of events in thousands for Tables 1 to 4. The division of these numbers gives the proportion shown in the respective tables of the main text.

TABLE 1:

FY1:

SURPRISE TYPE	Revisions Momentum by Itself	Predicted Surprise Agrees with Revisions Momentum	Predicted Surprise Disagrees with Revision Momentum	Predicted Surprise by Itself	N >10
OVERALL	229.8/340.1	36.2/47.8	16.3/32.7	58.5/89.9	67%
NEGATIVE	112.4/172.7	22.1/28.2	9.6/17.5	35.5/51.4	68%
POSITIVE	117.4/167.3	14.1/19.5	6.8/15.1	23.0/38.5	66%

FQ1:

SURPRISE TYPE	Revisions Momentum by Itself	Predicted Surprise Agrees with Revisions Momentum	Predicted Surprise Disagrees with Revision Momentum	Predicted Surprise by Itself	N >10
OVERALL	147.1/235.3	32.8/46.8	25.5/50.4	91.5/152.6	67%
NEGATIVE	70.9/134.8	19.1/29.1	11.2/25.0	46.9/84.6	68%
POSITIVE	76.1/100.7	13.6/17.6	14.2/25.3	44.6/67.9	66%

TABLE 2.

FY1:

SURPRISE TYPE	2% to 5%	5% to 10%	10% to 20%	>20%
OVERALL	31.5/49.9	13.8/20.9	7.6/11.2	5.4/7.5
NEGATIVE	17.8/27.0	8.6/12.3	5.1/7.0	4.0/5.1
POSITIVE	13.7/22.9	5.1/8.6	2.4/4.1	1.5/2.5

FQ1:

SURPRISE TYPE	2% to 5%	5% to 10%	10% to 20%	>20%
OVERALL	51.0/88.0	22.5/37.0	11.4/17.9	6.4/9.4
NEGATIVE	23.2/46.3	12.2/21.2	7.1/11.1	4.4/6.1
POSITIVE	27.8/41.7	10.3/15.8	4.3/6.8	2.1/3.4

TABLE 3.

FY1:

MARKET CAPITALIZATION	Overall Surprises	Negative Surprises	Positive Surprises
LARGE	9.6/14.3	5.7/8.2	3.9/6.2
MID	9.2/13.9	5.5/8.0	3.6/5.9
SMALL	39.8/61.7	24.3/35.3	15.4/26.4

FQ1:

MARKET CAPITALIZATION	Overall Surprises	Negative Surprises	Positive Surprises
LARGE	14.2/22.0	7.2/12.3	7.0/9.7
MID	15.6/25.5	7.7/14.0	7.9/11.5
SMALL	61.7/105.0	32.0/58.3	29.7/46.7

FY1:

ECONOMIC SECTOR	OVERALL SURPRISES	NEGATIVE SURPRISES	POSITIVE SURPRISES
Energy	9.2/14.0	5.5/7.7	3.7/6.3
Basic Materials	5.8/8.6	3.9/5.2	1.9/3.5
Industrials	6.1/9.2	3.9/5.5	2.2/3.7
Consumer Cyclicals	6.5/9.9	4.0/5.7	2.4/4.2
Consumer Non-Cyclicals	2.4/3.6	1.6/2.2	0.8/1.4
Financials	10.0/15.8	5.7/8.7	4.3/7.0
Healthcare	2.8/4.4	1.5/2.4	1.3/2.0
Technology	6.4/10.2	3.3/5.3	3.1/4.8
Telecommunications Services	2.7/4.2	1.7/2.6	0.9/1.6
Utilities	2.8/4.4	1.7/2.6	1.1/1.8

FQ1:

ECONOMIC SECTOR	OVERALL SURPRISES	NEGATIVE SURPRISES	POSITIVE SURPRISES
Energy	12.9/20.4	7.1/11.1	5.8/9.3
Basic Materials	6.0/10.0	3.6/5.9	2.4/4.0
Industrials	11.6/19.8	6.2/11.5	5.5/8.3
Consumer Cyclicals	12.3/20.3	6.0/11.1	6.3/9.1
Consumer Non-Cyclicals	3.0/5.3	1.6/3.1	1.4/2.2
Financials	16.7/28.2	8.6/15.4	8.1/12.8
Healthcare	6.2/10.7	2.7/5.5	3.5/5.1
Technology	10.2/17.0	4.1/8.9	6.1/8.1
Telecommunications Services	1.7/3.0	0.9/1.7	0.8/1.3
Utilities	3.7/6.4	1.9/3.5	1.7/2.9

TABLE 4.

FY1:

SURPRISE TYPE	0 < N ≤ 2	2 < N ≤ 5	5 < N ≤ 10	N > 10
OVERALL	13.8/22.4	20.1/30.9	15.1/22.5	9.3/13.9
NEGATIVE	8.2/12.4	12.3/17.5	9.6/13.4	5.2/7.6
POSITIVE	5.5/9.9	7.7/13.1	5.5/9.0	4.1/6.2

FQ1:

SURPRISE TYPE	0 < N ≤ 2	2 < N ≤ 5	5 < N ≤ 10	N > 10
OVERALL	22.7/40.1	35.1/58.9	21.4/34.4	12.2/19.0
NEGATIVE	11.8/22.0	18.2/32.7	11.3/19.8	5.5/10.0
POSITIVE	10.9/18.0	16.9/26.1	10.1/14.7	6.7/9.0

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