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U.S. Equity Strategy

Management Sentiment NLP Model Implies Subdued Capex Growth

MACRO STRATEGY

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We believe that capex growth is likely to stay subdued based on a framework that forecasts capex using a Natural Language Processing (NLP) model of management sentiment toward capital expenditure expressed during earnings calls. The recent moderation in capex growth has also been higher in companies with higher international sales and those more exposed to the U.S.-China trade war. This lends credence to the view that trade tensions and the broader non-U.S. economic slowdown are weighing on U.S. corporate sentiment.

Capex growth for listed U.S. equities and economy-wide measures of fixed investment have declined after a modest tax law–driven bump in 2018. Looking at 2Q19, while Private Nonresidential Fixed Investment was negative, listed capex growth rebounded slightly; however, capex growth for companies with higher international sales and exposure to the U.S.-China trade war was relatively lower.

We construct a robust Natural Language Processing model that analyzes earnings call transcripts to detect positive or negative management sentiment toward capital spending. We show that the resultant indicators broadly track the economic cycle and capex growth.

We combine our NLP signals with leading economic indicators to construct a robust capex forecasting model. We show that while changes in the LEI (Leading Economic Index) and our NLP signal are highly correlated, they do offer complementary explanatory power for capex growth over the next four quarters. The r-squared of the combined model is better than the respective single factor models. **Based on this framework, we forecast that the recent uptick in capex growth is likely to be short-lived. We expect zero capex growth for the next two quarters and a modest uptick toward the middle of 2020. These results are consistent with Barclays economists' view that the recovery in Private Nonresidential Fixed investment is likely to be gradual.**

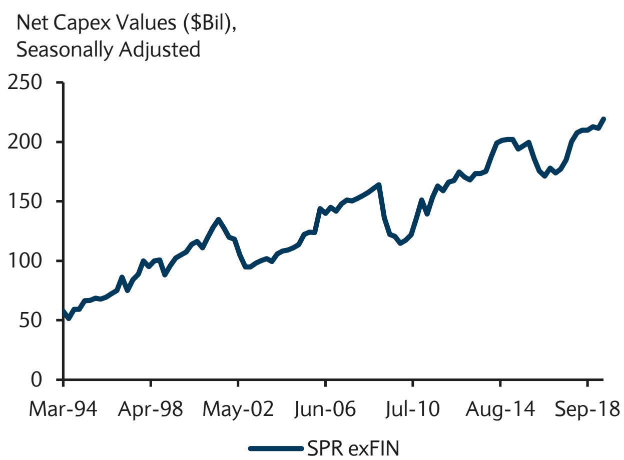
Capex Growth Slowing Due Trade Tensions

Capex Trends: A Long-Term Perspective

Figure 1 plots the seasonally adjusted net capex (capital expenditures - sales of property) for stocks in the S&P 1500 ex-Financials (SPR ex-Financials) since the 1990s. Note that we adjust this series for changes in constituents and seasonality. Over the long term, capex naturally grows along with the size of the economy; Figure 2 plots the net capex normalized by operating cash flow. This normalized metric more clearly illustrates how companies are choosing to spend the cash from their operating activities. As we have discussed in detail before (*U.S. Equity Strategy: Tax driven changes in corporate cash spending patterns*, 9/27/18) this normalized capex has trended down over the past two decades. In the 1990s, it accounted for ~60-70% of CFO but this percentage has declined to ~40-50% over the past decade. In our opinion, this is because U.S. companies have pursued a capital-light model and effectively outsourced their capital expenditure to China and other emerging market (EM) countries. In addition, this trend also probably reflects the drop in trend growth for the global economies, which has translated into lower desire for future investments. Instead, companies have chosen to return their cash flow to investors via dividends and buybacks.

FIGURE 1

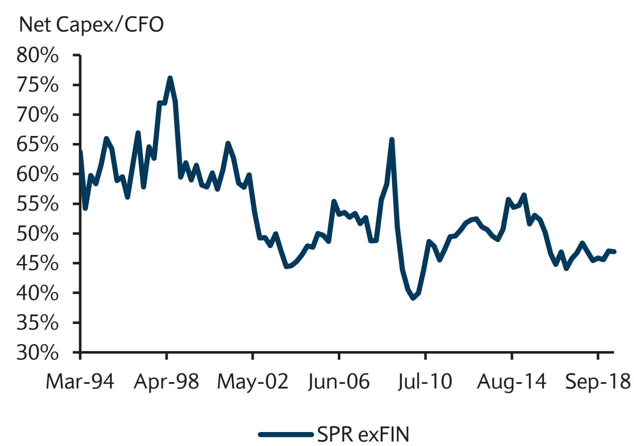
Net capex has steadily trended up over time…



Source: Barclays Research, Refinitiv
Note: Universe is S&P 1500 index ex-financials and we adjust the capex-changing constituents and seasonality.

FIGURE 2

… but on a normalized basis it has stabilized after dropping since the 1990s



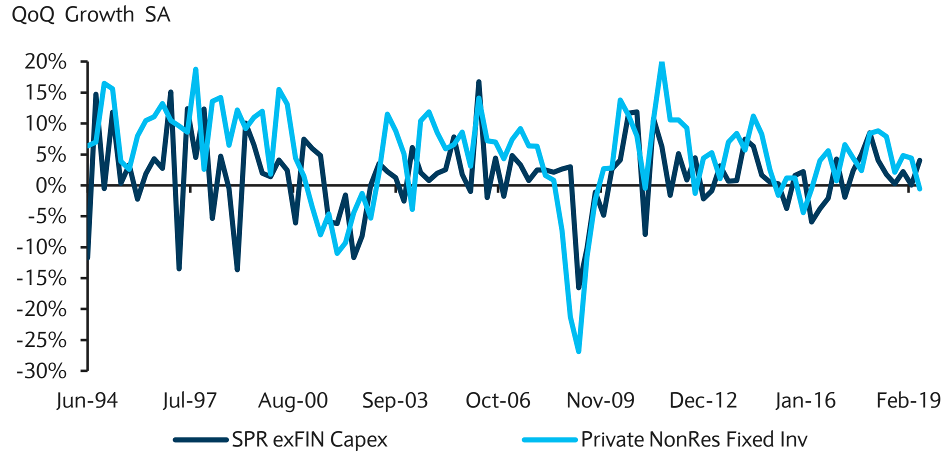
Source: Barclays Research, Refinitiv
Note: Net capex and CFO are both seasonally adjusted

Figure 3 compares the quarter-over-quarter growth in net capex with a proxy for economy-wide capital expenditure (Real Private Nonresidential Fixed Investment). We see that the two series broadly track each other, although the correlation in not perfect.

Historically there have been three major slowdowns in capex growth: the early 2000 dot-com bubble, the financial crisis, and most recently, the 2015 crude oil price plunge. More recently, capex growth modestly increased in late 2017/early 2018 thanks to the surge in companies' cash flows due to changes in tax law.

FIGURE 3

Capex growth for S&P 1500 companies growth broadly tracks economy-wide measures of fixed investment



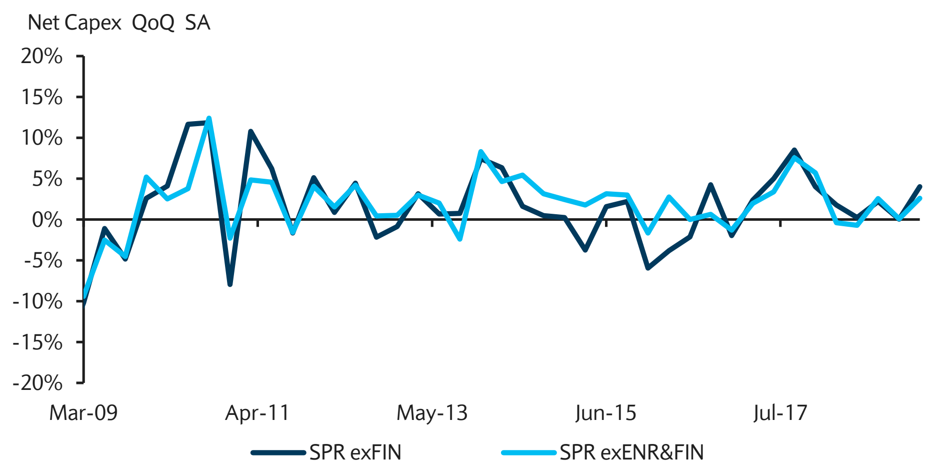
Source: Barclays Research, BEA, Haver

Recent Trends Point to a Slowdown in Capex

Figure 3 shows the recent slowdown in private investment (-0.6% for 2Q19) which has been attributed to reluctance by companies to invest because of trade uncertainties. However, after slowing over the past few quarters, the bottom-up Capex appears to have rebounded as shown in more detail in Figure 4. The chart also shows the Capex growth for SPR ex Financials and Energy, and we see that much of the drop during 2016 was in the Energy sector as those companies cut Capex plans due to the plunge in oil prices.

FIGURE 4

Capex growth has been weak recently although it rebounded modestly in 2Q19

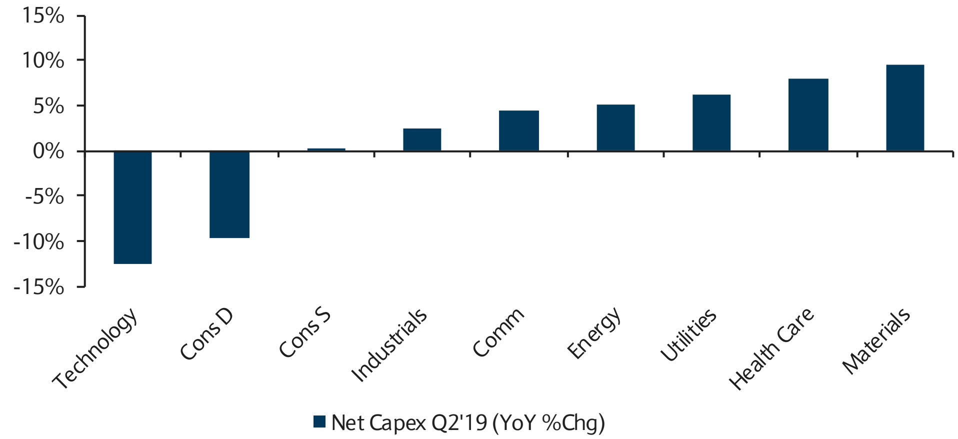


Source: Barclays Research, Refinitiv

Figure 5, however, shows that there is considerable cross-sectional dispersion in the 2Q19 year-over-year capex growth across sectors plots. While capex growth remains resilient in Utilities, Health Care and Materials sectors, capex reduced in the Technology and Consumer Discretionary sectors.

FIGURE 5

2Q19 capex y/y growth exhibits a large degree of cross-sectional dispersion

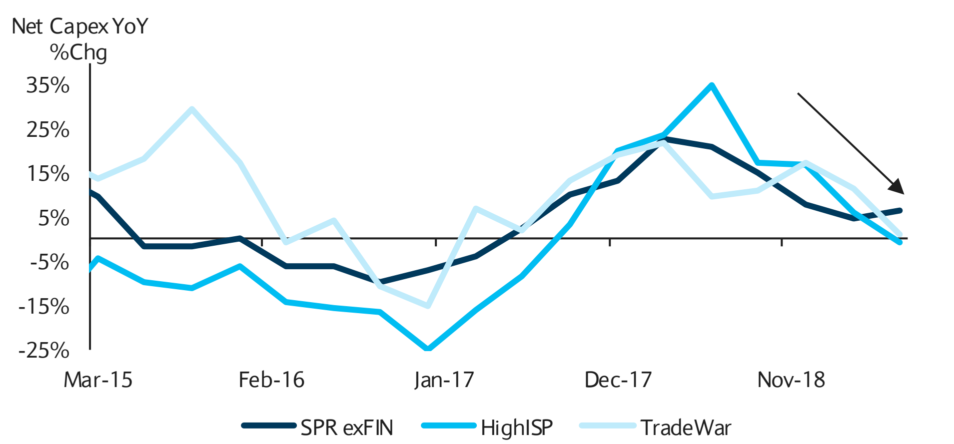


Source: Barclays Research, Refinitiv

These sectors are also the most affected by U.S. China trade war and the China credit cycle–driven international economic slowdown (*Equity Compass: EPS Growth projections improve, but international headwinds increase*, 9/3/19). Figure 6 illustrates that year-over-year Capex growth for companies exposed to high international sales percentage (High ISP) and directly exposed to the U.S.-China trade war declined more significantly relative to the broader universe.

FIGURE 6

Capex growth slowdown is more significant for stocks exposed to high international sales (ISP) and US-China trade war



Source: Barclays Research, Refinitiv

Escalation of trade war and deteriorating global economy could further weigh on companies' capex decisions as they face an uncertain environment. In the remainder of this report, we develop a model to forecast Capex using economic and company-management sentiment data.

Measuring Capex Sentiment from Earnings Calls Using Natural Language Processing

A natural source of forward-looking information for capital expenditure decisions is to examine guidance and commentary by company management during earnings calls. In this section, we briefly describe our model to capture sentiment toward capital expenditure sentiment expressed by company management in their earnings calls using Natural Language Processing (NLP).

The world of NLP is expansive, since text is such a high-dimensional source of information that for practical purposes there is a seemingly endless variety of ways to process it. Our approach to using NLP for investment research is to extract features, i.e. quantitative representations of text, which are appropriate for modelling or analysis. To do that feature extraction, we use a variety of tools, models, and algorithms, which process texts to create these representations.

The NLP approach we are using to develop insights about capital spending plans is event detection within earnings transcripts. The “event” is the expression of a concept in the text; in an earnings-call transcript that would mean that something spoken by a participant in the call. We chose to use grammar rules as our tool because they’re simple enough to be understood by non-experts, have low risk of failure, can capture some of the non-linearity in text, are flexible enough to answer a wide range of questions, and require only a modest investment in total human resources to create a working detection.

Applying our general method, we have developed rules to detect when S&P 1500 earnings calls feature discussion of decreases and increases in capital spending. The final output of the process is a binary data series (1 for a detection, or 0 for a non-detection), with an entry for each quarterly earnings transcript from an S&P 1500 company in the past 20 years. [1]

One advantage of grammar rules for investing is the flexibility to adjust rules depending on the task. We have the flexibility to tailor the strictness of our detections. Using a loose rule, we can capture more of the total discoverable events (high recall), but at the cost of generating more false positives (low precision). At the other end of the spectrum, a tight rule will have many fewer total detections (low recall), but each detection is more likely to be a true positive (high precision). We considered three variations for finding the best measure of predicting future capital spending plans:

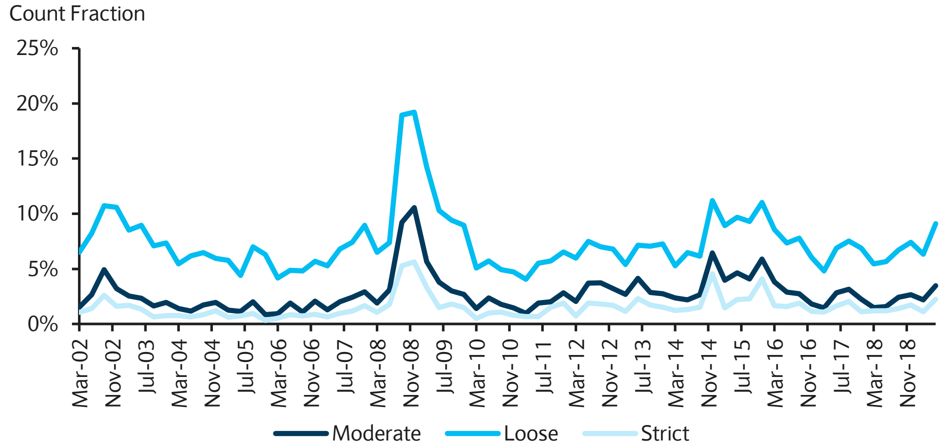
- **Loose:** Using just lemmatized (word roots) search, if one sentence contains both “CapEx” synonyms and “Reduction” synonyms, we count it as a detection.
- **Moderate**: Start with the sentences produced by the “Loose” rule, and apply rules on the sentences detected from lemmatized search to remove some false positives by i) dropping those that contained irrelevant terms such as “working capital” and “capital intensity”, and ii) dropping sentences discussing CapEx reductions of customers
- **Tight:** Further restrict the moderate rule by removing sentences where the context for capital spending is i) in the past or present tense, ii) in a hypothetical tone, or iii) in a questioning tone

There was a substantial difference in the total number of detections between the three variants, but they are also highly correlated (Figure 7).

[1] Our source of transcripts excludes a small number of historical S&P 1500 companies which were later acquired.

FIGURE 7

Substantial difference in the number of detections across NLP models but results are fairly correlated



Source: Barclays Research, Refinitiv

Finally, we also created a separate series to detect increases in capital spending, which effectively replaced synonyms of "reduce" for those of "increase" in a rule of the same strictness as the one for debt decreases.

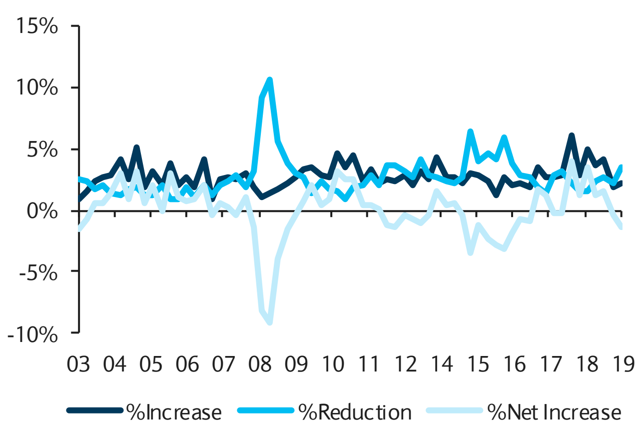
We define the aggregate capex sentiment as the ratio of capex increase minus reduction detections by number of transcripts for each earnings quarter (NLP_t):

$$NLP_t = \frac{\#increase(t)\ - \#reduction(t)}{\#\ transcripts(t)}$$

Figure 8 and Figure 9 plot Increase, Reduction and Net fractions for the Moderate rule for SPR ex-Fin and SPX ex-FinEnergy universes. It is reassuring that the broad trends in these time series are similar to that for capex. In particular, the net series drops in 2008 and in 2016 but only for SPR ex-Fin.

FIGURE 8

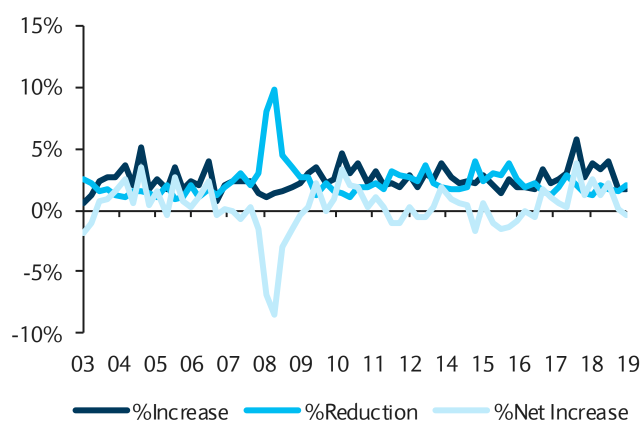
The aggregate NLP signals for S&P 1500 over time…



Source: Barclays Research, Refinitiv

FIGURE 9

… and the time series for S&P 1500 ex-Energy look similar except the 2014/15 period

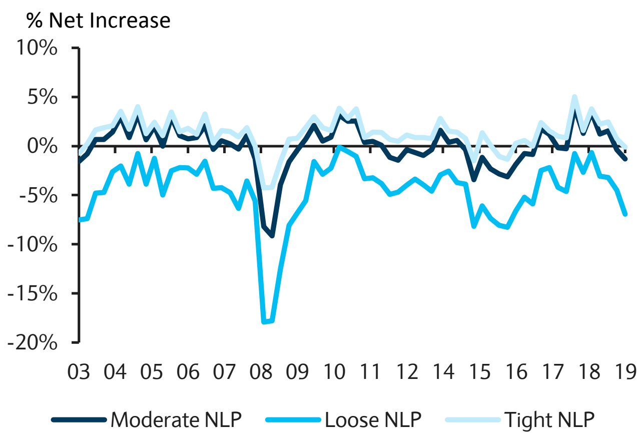


Source: Barclays Research, Refinitiv

Figure 10 plots the three NLP signals and we see that the signals are quite correlated. Figure 11 quantifies the correlation and shows that they are also correlated with changes in the LEI (Leading Economic Index) which tracks the business cycle.

FIGURE 10

The NLP signals are highly correlated…



Source: Barclays Research, Refinitiv

FIGURE 11

… and correlations with LEI are also high

	LEI.3M	NLP Moderate	NLP Loose	NLP Tight
LEI.3M	100%			
NLP Moderate	65%	100%		
NLP Loose	71%	95%	100%	
NLP Tight	61%	97%	91%	100%

Source: Barclays Research, Refinitiv

Capex Forecasting Models

We now construct series of models to predict net capex growth (q/q, SA) for the next 1-, 2-, 3-, and 4-quarters ahead defined as:

$$y_{t,h} = \frac{Capex_{t+h} - Capex_t}{Capex_t}, h = 1, 2, 3, 4$$

We start from a baseline "Macro" model, which only uses 3m changes in LEI (leading economic indicator) to forecast capex. LEI is published by The Conference Board as an economic cycle indicator which we have shown is quite useful for predicting earnings in our previous study (*EPS forecast model*, 6/11/18). We also include the trailing capex growth ($y_{t-1,1}$) at t to account for auto-correlation effects. Thus, our "Macro" model can be written as:

$$y_{t,h} = \alpha + \beta_1 \, LEI_{3m,t} + \beta_2 y_{t-1,1}, \qquad h = 1, 2, 3,4$$

The "NLP" model uses one of our NLP signal as the explanatory variable.

$$y_{t,h} = \alpha + \beta_1 \, NLP_t + \beta_2 y_{t-1,1}, \qquad h = 1, 2, 3,4$$

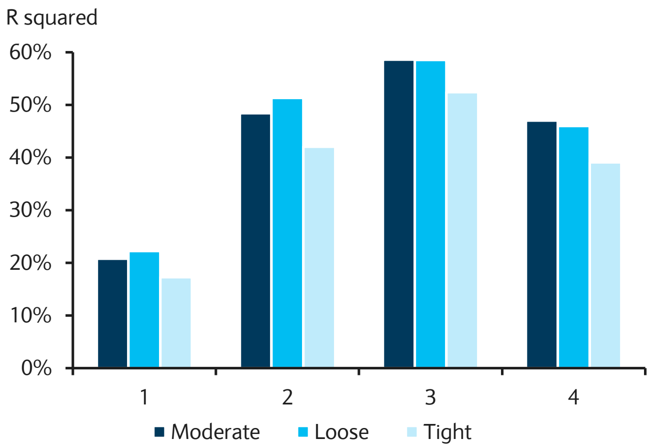
Finally, our combined model include all the factors above:

$$y_{t,h} = \alpha + \beta_1 NLP_t + \beta_2 LEI_{3m,t} + \beta_3 y_{t-1,1}, \qquad h = 1, 2, 3, 4$$

First, we compare the efficacy of the different NLP signals. Figure 12 and Figure 13 plot the R^2 and t-values for the coefficient on NLP_t across different models. It is reassuring to see that all three signals generate similar R squared and significant t-values. For simplicity, we will use the Moderate NLP signal as our main model given is higher R-squared.

FIGURE 12

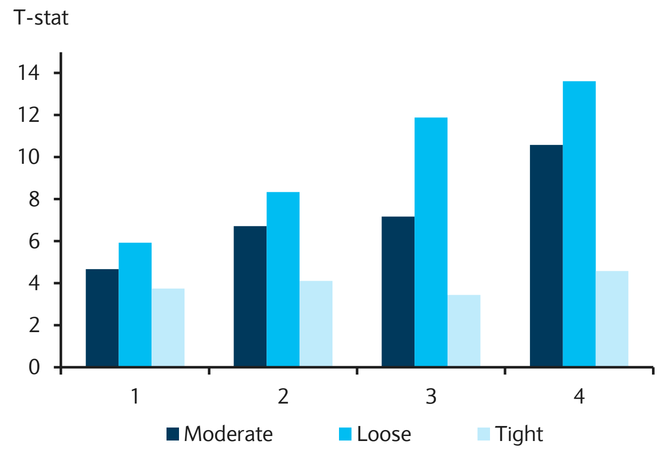
The model r-squares are quite consistent across different NLP signals and horizons…



Source: Barclays Research, Refinitiv

FIGURE 13

… Although the t-stats are more significant for the Loose model



Source: Barclays Research, Refinitiv
Note: t-values are Newey-West adjusted

We summarise the statistics of the Macro and NLP forecast models in Figure 14. The NLP model appears to do slightly better than the Macro model and the NLP shows significant predictive power for capex growth up to four quarters ahead (t-values generally above 4). It confirms that management sentiment on company capex possesses valuable information which can be at least as informative as the macro leading indicators, if not more.

FIGURE 14

Both our Macro and NLP forecast models

Macro	Coefficients			T-stat			R^2
	Intercept	LEI.3M	Capex QoQ SA	Intercept	LEI.3M	Capex QoQ SA	
1	0.01	0.48	-0.08	1.86	4.24	-0.72	22%
2	0.03	0.93	-0.19	1.99	4.28	-1.44	36%
3	0.04	1.29	-0.20	1.89	3.10	-0.91	44%
4	0.06	1.61	-0.39	1.67	4.18	-1.35	45%
NLP	**Coefficients**			**T-stat**			**R^2**
	Intercept	NLP	Capex QoQ SA	Intercept	NLP	Capex QoQ SA	
1	0.02	1.02	-0.03	3.09	4.45	-0.16	21%
2	0.04	2.34	-0.13	3.25	8.02	-0.67	48%
3	0.06	3.25	-0.11	4.16	8.70	-0.61	59%
4	0.08	3.58	-0.22	4.48	8.43	-1.84	47%

Source: Barclays Research, Bloomberg, Refinitiv

Finally, Figure 15 summarises our combined model. We find in the final model, NLP signal remains statistically significant after controlling for LEI (t-values above 2), meaning that LEI is not able to subsume the predictive power of NLP signal. We also see that the R-squared for the combined model are uniformly better.

FIGURE 15

In the combined model, both LEI and NLP factors remain significant and the overall R-squared improves

Final	Intercept	NLP	LEI	Capex QoQ SA
	Coefficients			
1	0.01	0.61	0.30	-0.09
2	0.03	1.78	0.42	-0.22
3	0.05	2.46	0.59	-0.23
4	0.07	2.29	0.96	-0.42
R^2	T-stat			
26%	2.90	2.14	2.14	-0.76
53%	3.26	4.91	1.60	-1.67
64%	3.87	4.50	1.98	-1.95
57%	4.13	2.58	2.18	-2.37

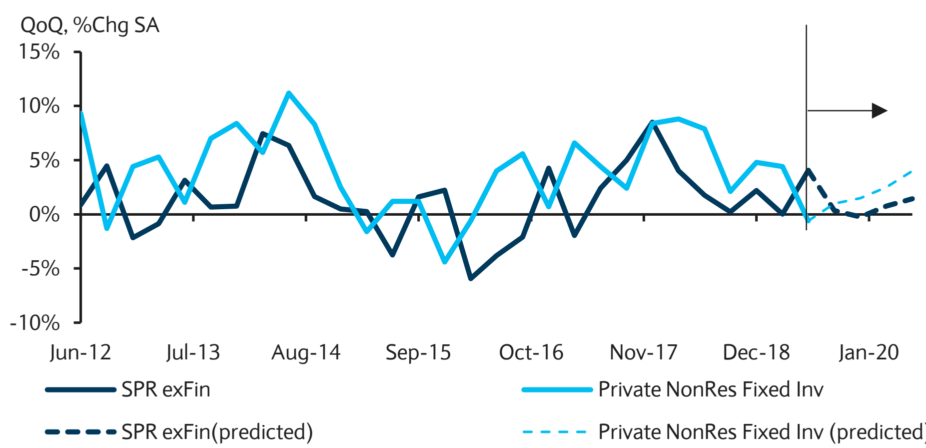
Source: Barclays Research, Bloomberg, Refinitiv

Capex Likely to Remain Subdued over the Next Year

Based on the final model, we forecast the next four quarters of capex for SPR exFIN. Based on the latest NLP and LEI signals our model predicts that capex growth will decline after the recent bounce, remain at relatively low levels, and then start modestly rebounding toward the second half of 2020. This is consistent with our economist's view on private non-residential investment, which is also on the path to a slow recovery (*US Country Snapshot*, 9/20/2019).

FIGURE 16

We predict capex growth to remain muted before slow recovery



Source: Barclays Research, Bloomberg, Refinitiv

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