High Yield Strategy

The Primer on HY Strategy Indicators

06 December 2019

Default Rate Indicator

The cornerstone of our analytical framework is our default rate model that attempts to estimate the next-12-months issuer-weighted HY defaults, by far the most important risk factor to HY portfolios. Because we believe that different factors are driving different time horizons of HY defaults, our model is built in a way that allows us to estimate relatively short-term and long-terms defaults separately, before aggregating them to the next-12mo figure. The following inputs make the most significant impact on expected defaults (4% for n12-mo with 95% probability that the default rates lie between 3.7% and 4.4%) in our models: Fed lending survey, issuers with plunging bonds, the degree of dispersion, and low quality issuance. Our model explains 87% of the variation in the next-12mo issuer-weighted HY default rates.

Liquidity Premium Indicator

Once we have a view on defaults, we can do two things: estimate the current level of liquidity premiums (actual OAS ex expected credit loss) and relate to its historical range. Our next model attempts to estimate the appropriate level of liquidity premiums given the prevailing macro conditions. It has an 84% r-sq and is driven primarily by the following inputs: treasury yield curve, flows into mutual funds, single-A spreads, and 10-year sovereign yields in major developed markets. Once we have an estimate for appropriate liquidity premium (210bps for n12mo, with 95% probability it will end up 190 and 230), we can transform it into a spread target (+ expected credit loss = 450bp).

Supply & Demand Indicator

Once we have developed a view on valuations, it is time to address market technicals. Two independent models help us arrive at estimates for HY gross issuance and the volume of calls/tenders in this market. Taking these inputs in combination with known schedules of upcoming maturities and coupons allows us to build a fully-fledged picture of supply & demand in this asset class. Our issuance forecast ($185bn with 95% probability it prints between $170bn and $200bn) is driven primarily by the following factors: issuance momentum, liquidity premiums, refinanceable coupons, and loans-for-bonds substitutions (81% r-sq). The model for calls in tenders is driven by recent momentum in optional redemptions as well as the next 12-mo issuance forecast from the previous step, among other factors (76% r-sq). Our n12-mo calls/tenders estimate is $115bn with 95% probability of calls between $105bn and $125bn.

Earnings Indicator

The final element of our analytical framework addresses market fundamentals by estimating the next-12-months percent change in EBITDAs. This model relies on historical earnings data for S&P500, a step that allowed us to go back 30 years of consistent data to measure the cyclicality in corporate profits. We found the following factors to be most relevant in estimating these data series: nonfarm payrolls, corporate debt issuance trends, capital expenditures, and prices of key cyclical commodities such as oil and copper (71% r-sq). Our earnings growth estimate for n12-mo is +1% with 95% probability of ranging between -0.5% and +2.5%. Once we have an estimate for overall market earnings growth, we can use it as an input to estimating sector earnings trends, as we have previously done in energy, cable, and chemicals. We will continue to expand this framework to other industries over time.

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Refer to important disclosures on page 12 to 13. 12047458

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BofAML Data Analytics

High Yield Strategy
United States

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Oleg Melentyev, CFA
Credit Strategist
BofAS
+1 646 855 6379
oleg.melentyev@bofa.com

Eric Yu
Credit Strategist
BofAS
+1 646 855 8663
eric.x.yu@bofa.com

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Default Rate Indicator

As we think about different default forecasting techniques we have come across over the years, a couple of challenges seem to be particularly persistent. One is the choice of independent and leading indicators. Oftentimes, models are based on variables that are derived from credit market valuations, which are in turn dependent on what expected credit losses are going to be, thus making results questionable in terms of the real incremental value they provide. Similarly, most macroeconomic indicators are generally correlated to coincident credit losses but have not demonstrated sustained leading relationships over them in the past.

Timing presents further challenges. Even if we identified a set of indicators that are both leading and independent, any given one of them could have a different degree of a leading relationship to expected credit losses. Some may do a better job in the immediate near-term, whereas others could be better off when applied over longer time horizons.

To address this particular issue, we have split our default rate estimate into effectively four independent models, each representing three-month intervals over the coming year (0-3 months, 3-6 months, etc.). Such an approach opens the door to choosing indicators that we believe are best suited to model expected credit losses with much greater time precision than simply forcing all of them to do so in the standard next-12mo approach.

Issuer-weighted default rates

The goal of our model is to predict the next-12-month value of Moody's US HY issuer-weighted default rate, which is defined as the number of companies defaulting over a given 12mo time horizon divided by the total number of issuers rated HY by this agency. Their definition of default includes filings for bankruptcy/liquidation, missed payments (coupon or principal), and distressed exchanges.

The latter type of events is sometimes open to interpretation, i.e. there are no bright line definition of constitutes a distressed exchange and what doesn't. A general rule of thumb is that if a company tendered/repurchased/exchanged or otherwise cancelled a debt obligation at a price materially below its face value, it is considered a distressed exchange. The lower the price, the stronger the argument to view such a transaction as a distressed exchange and count it as a default.

All regressions in our model use as-reported factor values known at the time of observation, i.e. at the end of each month. Built this way, our model does not require any estimates or judgments on factor values themselves; it always uses only their actual known values.

Sometimes we use original (as-reported) factor values; other times we use various forms of derivative values that are chosen to optimize the model fit. We apply transformations to some input variables in a systematic way, including quadratic, ratios, trailing averages, and volatility-normalized versions of original values.

In discussing model inputs below we do provide general description of input variables we use for the benefit of establishing model credibility with our readers. At the same time we do not provide the exact definition of transformations applied nor do we share the raw underlying model inputs for a number of reasons, including the proprietary nature of exact model construct, the restrictions on redistribution of certain third-party data used as an input, and the fact that its various components run in various applications and do not have simple Excel representations. We are open to sharing model output with those interested in gaining access to the signals it produces.

Based on our backtests, we identified the following types of input variables to have the strongest leading relationships over subsequent issuer-weighted default rates. Note that various subsets of these variables were used in four independent 3-mo regressions.

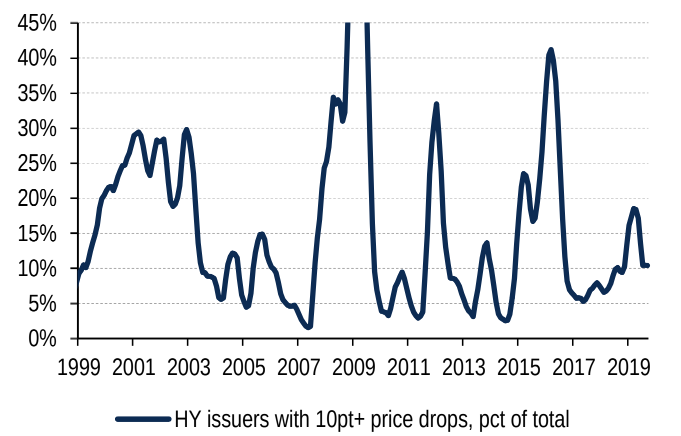
Shown in parenthesis are the *minimum* t-stats generated by any model input in the context of multivariate linear regression:

- fed lending survey (min absolute t-stat of 17.4x)
- proportion of issuers with 10pt+ drops (12.6x)
- degree of dispersion in HY (12.3x)
- CCC-rated issuance in HY/loans (10.5x)
- rates volatility (10.1x)
- non-financial corporate leverage (10.4x)
- long-term eqty volatility (8.6x)
- price of oil (5.4x)

All regressions above were built based on historical data going back to February 1998, monthly. Some input variables are self-explanatory by their name. Instances where we thought explanations could be useful are as following:

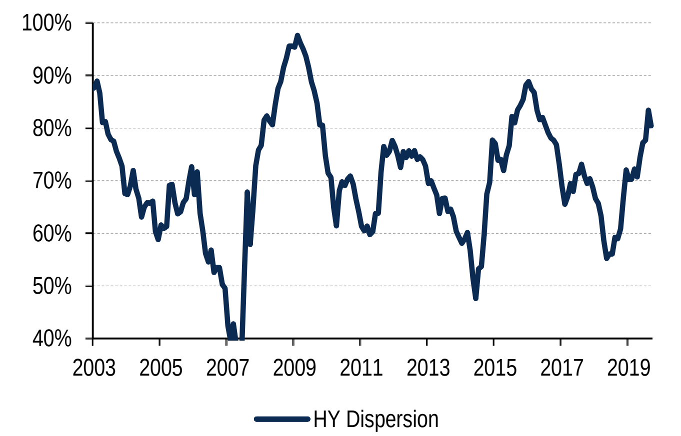
- Issuers with 10pt+ drops: instances where any given bond in a capstructure has dropped from max to min dollar price level by 10pts or more at any point in previous six months (Figure 1);
- Degree of dispersion in HY: proportion of face value in the DM USD HY index marked outside +/-100bps of overall index level (Figure 2);
- Fed lending survey: senior loan officer opinion survey on bank lending practices (SLOOS), the net percentage of respondents tightening standards for C&I loans to large/medium-sized borrowers.

Figure 1: Proportion of issuers with bonds dropping by 10pts+



Source: BofA Merrill Lynch Global Research

Figure 2: Dispersion ratio in HY, pct of face value



Source: BofA Merrill Lynch Global Research

The adjusted r-squareds are lower for longer-time-horizon models: 85% in the 0-3mo model, 70% in the 3-6mo, and 61% in the 6-9mo and 9-12mo cases. We find this to be a natural outcome of greater uncertainty that comes with longer time horizons.

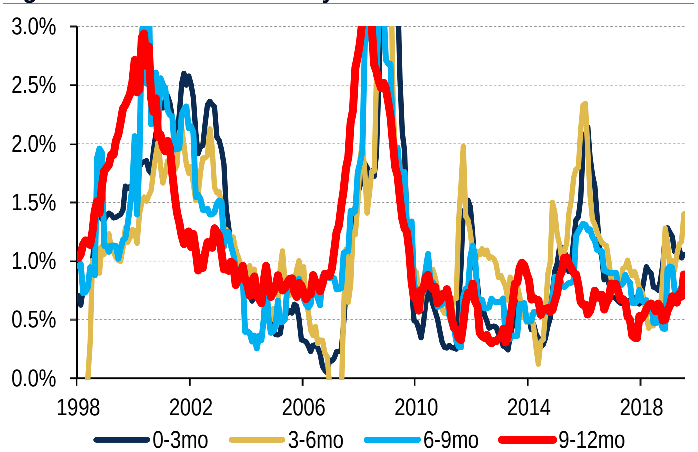
With the four time horizons regressed independently (Figure 3), we then transform those default rates into expected issuer default count in each three-month period. Once component 3mo default counts are known we aggregate them up to the next-12mo count and arrive at our one-year-out default rate forecast by dividing this count by the know issuer universe size today.

Figure 3 shows the historical model estimates behind each 3mo component window. Readers may have noticed greater volatility in the near-term horizons relative to longer term estimates. We think this makes sense as the near-term time horizons are more likely to be impacted by episodes of temporary market volatility, whereas default pressures over the longer timeframes should be driven by more pronounced changes in credit availability. In other words, the 9-12mo estimate is more difficult to turn, but once it turns it is less likely to normalize quickly.

> The turns in both of the previous credit cycles in 2007-2009 and 2000-2002 were precipitated by the longer-time horizon estimates (9-12mo and 6-9mo) leading the near-term estimates.

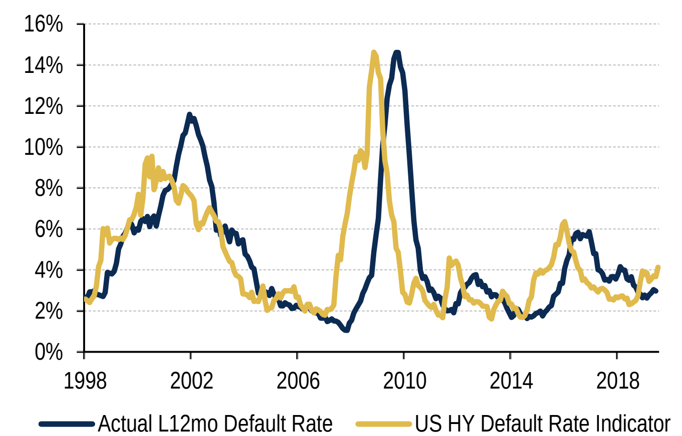
Figure 4 goes on to show the aggregate 12mo actual Moody's issuer-weighted default rate (blue line) vs our model estimate (yellow). Notice how the yellow line is consistently shifted to the left of the blue line. This is by design and the lag reflects our model's intentional construct to be 12mo ahead of the realized changes in default rates.

Figure 3: Default rate estimates by time horizon



Back-testing is hypothetical in nature and reflects application of the model prior to its introduction. It is not actual performance and it is not intended to be indicative of future performance.
Source: BofA Merrill Lynch Global Research

Figure 4: Actual vs estimated HY issuer default rate



Back-testing is hypothetical in nature and reflects application of the model prior to its introduction. It is not actual performance and it is not intended to be indicative of future performance.
Source: BofA Merrill Lynch Global Research

Figure 5 below goes on to show the relationship between our model-produced estimate for next-12mo issuer-weighted US HY defaults, and the actual subsequent realized rate. So our overall estimate derived as a function of four independent estimates explains 87% of variation in the target dataset.

Dollar-weighted default rate

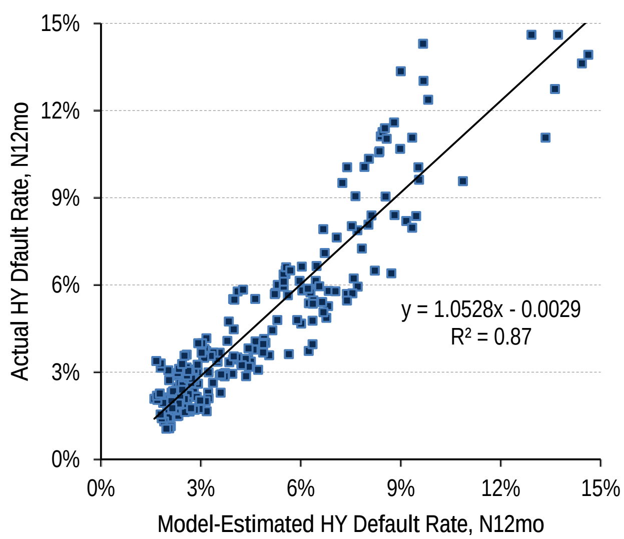
The discussion to this point was focused on estimating issuer-weighted default rate series as the goal of our modeling effort. Issuer-weighted default rates are well equipped at estimating default probabilities, irrespective of the size of issuers involved. A dollar-weighted (or par-weighted) default rate takes that next step by sizing each default event in proportion to the debt involved, and is calculated as the dollar amount of defaults in a given 12mo time horizon, divided by the total amount of debt rated HY by Moody's at the beginning of the period.

Our approach to modeling dollar-weighted default rates takes issuer-weighted estimate as an input and scales it proportionally to the size/concentration of distressed bonds. To do this, we establish the relationship between par/issuer distress ratio today and next-12mo par/issuer default rate. The implicit assumption here is the concentration of distress by size today gives us a good sense of concentration of defaults by size tomorrow.

Note that we do not rely on the distress ratio itself to forecast default probabilities – also the relative size of future defaulters. Distress here as defined as bonds trading at OAS of 1,000bps or wider.

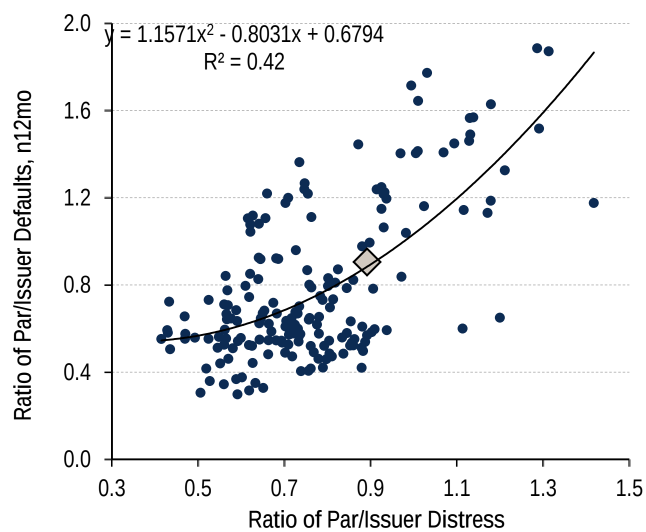
Figure 6 shows the relationship between these two ratios: relative concentration of distress today versus relative concentration of defaults twelve months from now. Of the four components present on this chart (par- and issuer-weighted default rates and par- and issuer-weighted distress ratios) only one is unknown to us at this point: the par default rate. We can thus solve for it, based on our knowledge of both distress ratios and as well as previously derived issuer default rate estimate.

Figure 5: Actual vs. estimated HY default rates, goodness-of-fit



Back-testing is hypothetical in nature and reflects application of the model prior to its introduction. It is not actual performance and it is not intended to be indicative of future performance.
Source: BofA Merrill Lynch Global Research

Figure 6: Par/issuer default rate vs distress ratio relationship



Back-testing is hypothetical in nature and reflects application of the model prior to its introduction. It is not actual performance and it is not intended to be indicative of future performance.
Source: BofA Merrill Lynch Global Research

Model limitations and risks

As with all regression-based models, our default rate model is limited by variable selection bias. Some other variables had a potential to be included in the model but did not make a cut for the same reason: their incremental contribution to the model was negligible in the context of the presence of other variables. Because our model relies on early indicators of credit stress that have worked in the years of its back-tested period, there remains a risk of it failing to properly react to new developments that might happen in the future.

For example, sources of volatility could be different in future downturns than those captured by our model (equities, rates, FX, oil, and credit), or tightening in lending standards could come not from banks regulated by the Fed, but from non-bank lenders that are not subject to the lending conditions survey the model employs. Just as any other model ours is subject to the risk of being oblivious to unknown unknowns.

The model performance calculations, such as t-stats, r-squared and other measures of statistical performance are based on back-tested monthly data since Jan 1993 for the issuer-weighted estimates and Jan 2001 for the par-weighted. The end-period for back-tested results is Sept 2017. Measures of statistical performance could change with different time horizons, and could improve or deteriorate as a result.

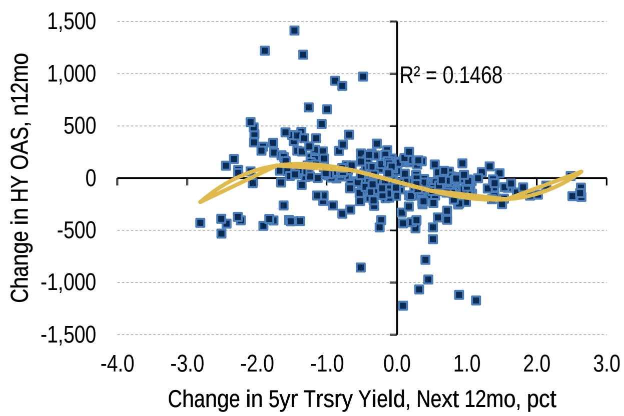
Liquidity Premium Indicator

When we think about HY bond valuations, we think about three key risk factors that have a direct impact on them: interest rates, credit losses, and liquidity conditions. The impact of rates is most visible in all-in HY yields; however spreads also show some residual sensitivity to rates, as Figure 7 demonstrates. Here we measure spread changes vs 5yr Treasury yield changes, and the r-squared of that relationship is relatively low, however, and the beta has a negative slope, meaning that higher interest rates imply tighter HY credit spreads, all else being equal. The low r-squared of this relationship also suggests that the connection between rates and HY spreads is loose.

Credit losses, on the other hand, naturally have a materially bigger impact on HY valuations. In Figure 8 we go on to show the relationship between changes in HY OAS (option adjusted spread) vs changes in expected credit losses, defined as next-12mo changes in our BofAML US HY Default Rate Indicator. The r-squared of this pair is at a solid 85%, and the slope is positive, albeit not linear. It goes from relatively low-beta to an exponentially rising one as we shift from small changes in defaults to larger moves.

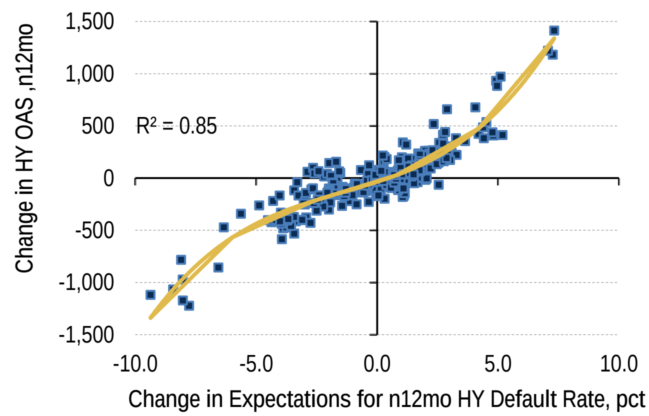
The loose/negative relationship of HY spreads to interest rates in Figure 7 and their tight/positive relationship to expected credit losses in Figure 8 is an important reminder of what this asset class is mostly about, in terms of its risk exposure.

Figure 7: Change in HY OAS (DM USD) vs change in 5yr treasury yield
Jan 1993 –Oct 2019



The chart shows back-tested results during the period from Jan 1993 to Oct 2019.
This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein.
Source: BofA Merrill Lynch Global Research, Bloomberg

Figure 8: Change in HY OAS vs change in expected default rate
Jan 1993 –Oct 2019



The chart shows back-tested results during the period from Jan 1993 to Oct 2019.
This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein.
Source: BofA Merrill Lynch Global Research, Bloomberg

Another important risk factor for HY is liquidity, which compensates investors for the potential costs associated with trading in and out of their positions in HY bonds. We define Liquidity Premium (LP) as the difference between current HY OAS and future expected credit losses. Because the interest rate risk has only a modest residual impact on HY spreads (as opposed to yields), we find it appropriate to measure it as a component of the LP, and not a stand-alone item.

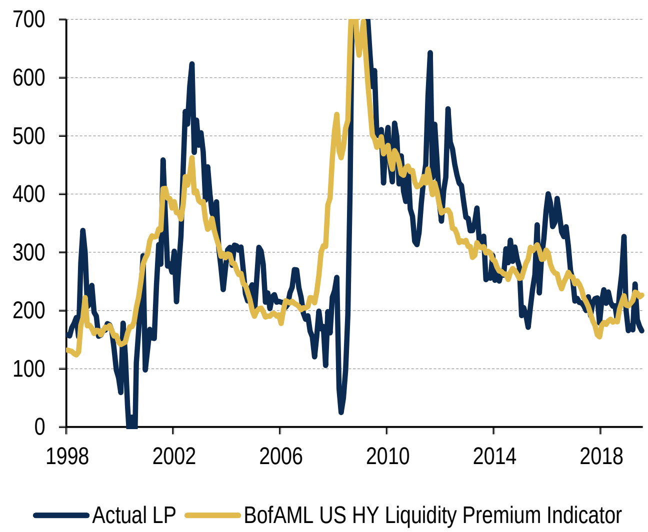
We derive our BofAML US HY Liquidity Premium Indicator using a parsimonious linear regression-based framework, which ensures that both past and future measurements of liquidity premiums are driven by transparent and replicable set of inputs.

We have made a choice to use the next 12-month *average* HY LP as the dependent variable for two reasons: (1) it smoothens out unnecessary quantitative noise in the original dataset; and (2) makes the measure more compatible to the next 12-month default rate, which effectively is a product of all months from 0 to 12, as opposed to a measurement of a closing date on a single month that happens to be a year away.

We have also identified the following set of independent variables as having the strongest power to explain variation (t-stat) in HY LPs: 2/30yr treasury yield curve (+17x t-stat), aggregate single-A spreads (+12x), 10-year sovereign yields in major developed markets (we include US, German, and Japanese 10yr yields, at +8x), long-term average flow into HY/loan funds (-6x).

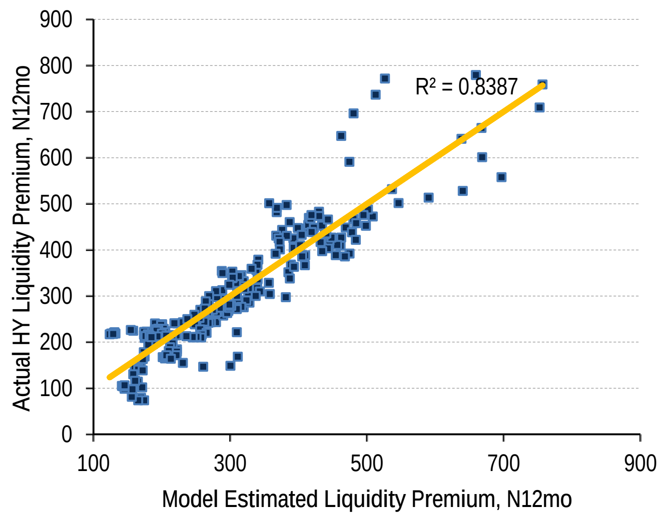
We apply transformations to some input variables in a systematic way, including percent changes, ratios, quadratic, and volatility-normalized versions of original values.

Figure 9: HY liquidity premium, actual vs estimated



Source: BofA Merrill Lynch Global Research, Bloomberg, ICE Data Indices, LLC

Figure 10: Actual vs. estimated HY liquidity premium, goodness-of-fit



Source: BofA Merrill Lynch Global Research, Bloomberg, ICE Data Indices, LLC

The yellow line in Figure 9 represents an estimated value of the next 12-month average HY liquidity premium based on the factors described above and Figure 10 goes on to show the goodness-of-fit between the realized and estimated HY liquidity premium. The four factors listed together generate an 84% r^2.

Current actual HY liquidity premium currently sits at 160bps (400bps OAS ex 240bps of expected credit loss). Our model estimates the average next-12mo LP to be 210bps. Between 240bps of credit loss (4.0% default rate, 40% recovery) and 210bps liquidity premium, we estimate the risk-neutral HY spread target to be 450bps, which is unchanged from our estimates over the past several months. Risk neutral spread implies we would be indifferent to either adding or removing incremental credit risk to whatever is considered to be the benchmark level for a given portfolio.

The risk-neutral spread measure is a point estimate by design, and yet realistically speaking, HY spreads rarely stay at a given level for any meaningful period of time. As such, they are more likely to oscillate in a range around our spread target, rather than be expected to stay at exactly that level. Under normal volatility conditions, we estimate such range to be +/-75bps on either side of the target.

Model limitations and risks

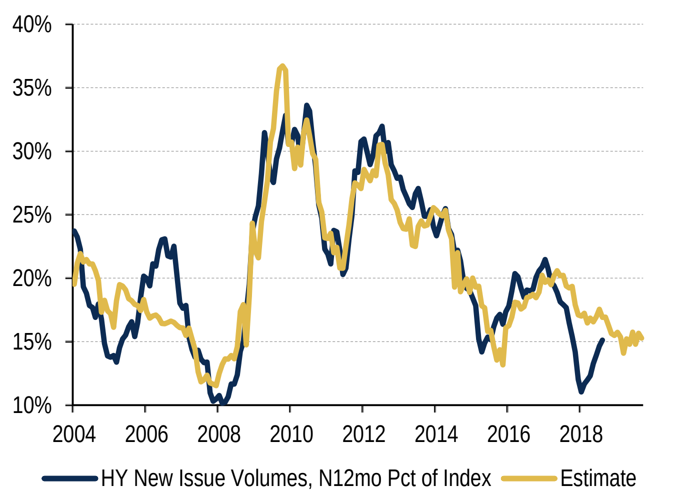
As stated previously, risk factors in HY valuation include credit losses, interest rates, and liquidity conditions. And while our work presented here helps estimate the potential impact from each factor, it must be noted that historical sensitivities may not provide accurate estimates in the future. For example, low interest-rate sensitivity over longer time horizons is sometimes interrupted by hyper-sensitive HY market reactions in specific episodes, as was the case around taper tantrum in 2013 or during the first nine months of 2018.

Other factors, not included in this framework directly may or may not be properly represented by some of the proxies in our models. An immediate example that comes to mind is the price of oil, which has not made it into our default/liquidity premium framework. We are including price change of oil in our BofAML US HY Default Indicator methodology, and our backtested analysis suggests that oil price fails to provide any incremental value to the LP framework. Whether it remains to be the case with this particular factor, or any other that did not make it into the framework, remains to be seen, i.e., factors that were not included in this iteration of the model could still become relevant in the future.

Supply & Demand Indicator

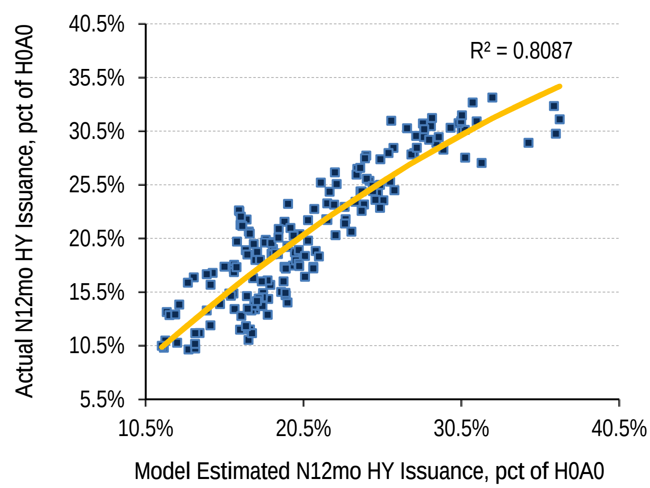
Technicals play equally important – and sometimes more important – role in HY bond valuations. When we think of technicals within the HY universe, there are two sides in the equation – supply and demand. Here we will explain the two sides separately and combine them in the end to show the whole picture – net supply.

Figure 11: Next-12mo HY issuance, pct of index size, actual vs estimate



Source: BofA Merrill Lynch Global Research

Figure 12: Actual vs. estimated N12mo issuance, goodness-of-fit



Source: BofA Merrill Lynch Global Research

In constructing model for HY issuance, our goal is to predict the next-12-month gross HY new deal volume issuance as percent of the index face.

Based on our backtests, we identified the following input variables to have the strongest leading relationships over subsequent 12-month issuance. Shown in parenthesis are the t-stats generated by model input in the context of multivariate linear regression:

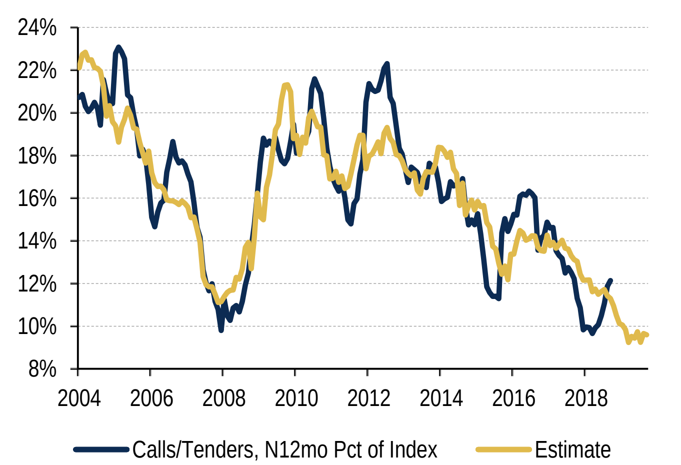
- previous issuance (t-stat of +16.4x)
- liquidity premium (7.8x)
- leveraged issuance (HY-loans) (7.3x)
- earnings growth (-5.9x)
- percent of refinanceable coupons (-4.5x)

We apply transformations to some input variables in a systematic way, including percent changes, ratios, quadratic, and volatility-normalized versions of original values.

The yellow line in Figure 11 represents an estimated value of the next 12-month HY gross issuance based on the factors described above. The five factors listed together generate an 81% r^2. On the right hand side, Figure 12 goes on to show the goodness-of-fit between actual N12mo issuance and the estimated. Our current estimate for the gross issuance over the next 12 months, according to our issuance forecast, is 15.3% of the $1.2trln index face ≈ $185bn.

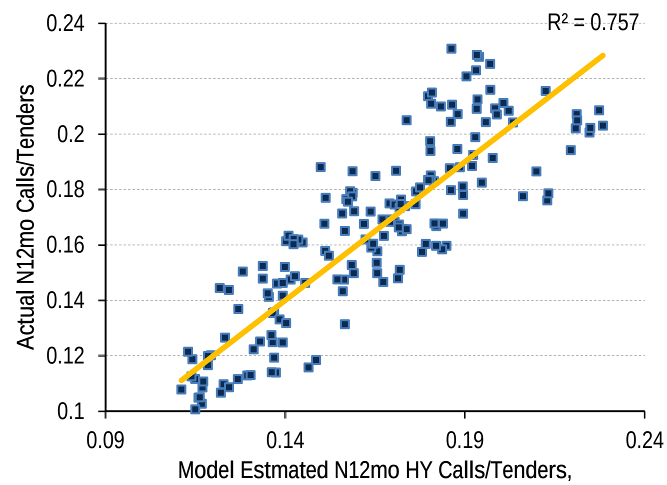
Next, we turn to the demand side of the equation, where calls/tender, maturities come into the picture. Please note that coupons and flows are excluded by design due to their temporary nature; fund flows are currently outside of scope of our models. Maturities do not require forecasting as they are known in advance. 2020 brings $39bn of such mandatory redemptions. Therefore the focus of this part is the calls/tenders component.

Figure 13: Next-12mo HY calls/tenders, pct of index size, actual vs est



Source: BofA Merrill Lynch Global Research

Figure 14: Actual vs. estimated N12mo calls/tenders, goodness-of-fit



Source: BofA Merrill Lynch Global Research

Stronger issuance usually leads to stronger optional redemptions. Additionally, calls/tenders are subject to the factors that impact issuance as well. Therefore we have the following input along with their t-stats to get our forecast on next 12-month calls/tenders:

- next 12-mo issuance (+17.5x)
- previous calls/tenders (t-stat of -6.5x)
- leveraged issuance (HY-loans) (+5.1x)

With the above input, our estimate on calls/tenders stands at 9.3% of $1.2trln index face ≈ $115bn with 76% r², as shown in Figure 13 and Figure 14. The $115bn is a 26% slowdown compared with $156bn annualized ytd pace of 2019. Measured by percent of index size, the 9.6% also represents a 15-year low.

Bringing gross issuance and calls/maturities together, we arrive at our net issuance estimate of +$31bn (calculated as the difference between gross issuance and calls/tenders/maturities).

Model limitations and risks

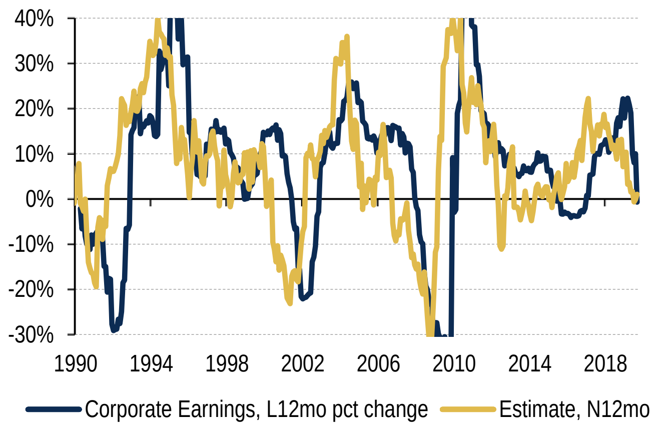
As with all regression-based models, our supply & demand model is limited by variable selection bias. Some other variables had a potential to be included in the model but did not make a cut for the same reason: their incremental contribution to the model was negligible in the context of the presence of other variables. Some of the variables selected might not be as encompassing as we want them to be. One such example would be the refinanceable coupons within the issuance model, which was supposed to capture higher prevailing yields in 2018 relative to the low coupons of the last several years. However the protracted slowdown in 2018 HY issuance still caught the model by surprise.

Earnings Indicator

The view on strength of issuer fundamentals is a critical component of our multi-faceted quantitative framework, which spans from credit losses to valuations to technicals. Here we are targeting the future growth rate in overall US corporate EBITDAs as our target variable, which then opens the door to forecasting leverage and sector-specific fundamentals.

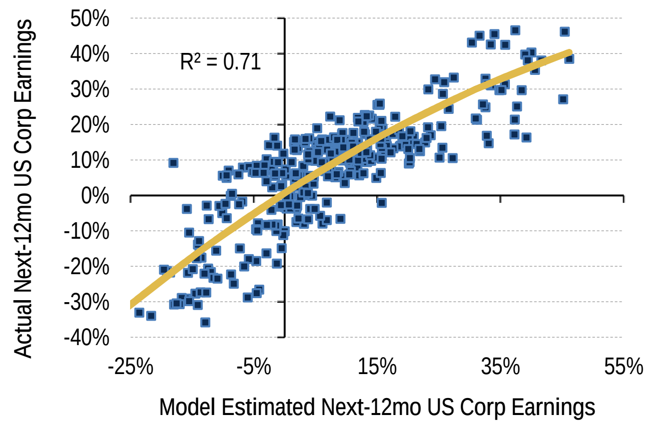
However, instead of estimating EBITDA growth directly, we resort to S&P500 EPS as an intermediary step mostly for the reason of consistent and high-frequency historical data availability. This choice allows us to build a monthly model, among other data quality benefits.

Figure 15: Actual vs estimated S&P500 EPS growth



Source: BofA Merrill Lynch Global Research

Figure 16: Actual vs estimated S&P500 EPS growth, goodness-of-fit



Source: BofA Merrill Lynch Global Research

The following variables have proven to be particularly relevant based on our backtests in explaining the variation in the next-12mo percent changes in S&P500 EPS. Shown in parenthesis are the t-stats generated by model input in the context of multivariate linear regression:

- capital expenditures (t-stat of +16.8x)
- US nonfarm payrolls (+10.9x)
- corporate debt issuance including HY, IG, and loans (+9.0x)
- the price of copper (+6.8x)
- the price of oil (-6.4x)

The regression model was built based on historical data going back to April 1989, monthly. The above variables should be self-explanatory by their names.

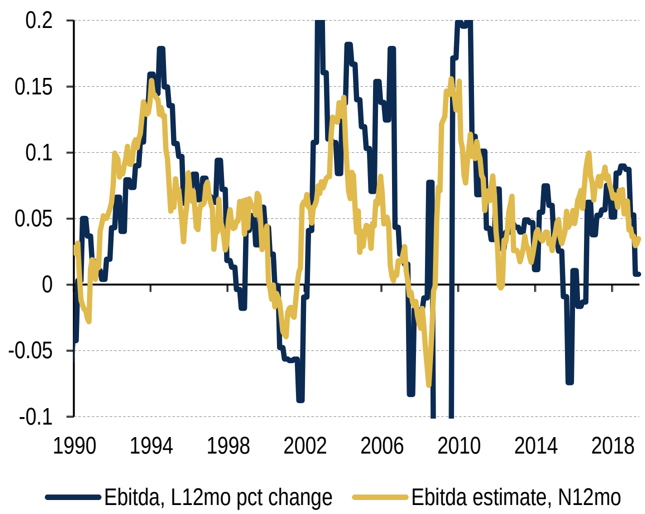
The regression model uses as-reported factor values known at the time of observation, i.e. at the end of each month. Built this way, our model does not require any estimates or judgments on factor values themselves; it always uses only their actual known values.

Sometimes we use original (as-reported) factor values; other times we use different forms of derivative values that are chosen to optimize the model fit. We apply transformations to some input variables in a systematic way, including percent changes, ratios, quadratic, and volatility-normalized versions of original values.

The above model delivers a good historical fit as shown in Figure 15 and Figure 16 and the r^2 is 71%. Based on current factor values, it estimates earnings to linger around current near-zero growth levels (1%) in a year from now.

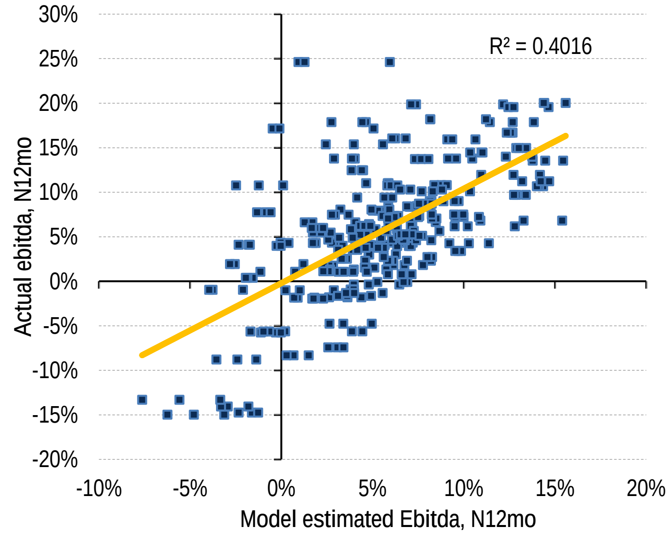
In the next step we transform the S&P 500 EPS growth estimate into all US non-financial corporate EBITDA growth estimate with a single-variable linear regression. Then we apply the linear relationship to our EPS growth forecast to arrive at EBITDA growth forecast. Translating the 1% eps growth into EBITDA growth, we arrive at 3.5% EBITDA growth a year from now based on the linear relationship. Both Figure 17 and Figure 18 demonstrate the relationship between realized and estimated EBITDA.

Figure 17: Actual vs estimated EBITDA growth



Source: BofA Merrill Lynch Global Research

Figure 18: Actual vs estimated EBITDA growth, goodness-of-fit



Source: BofA Merrill Lynch Global Research

Model limitations and risks

The model does not capture the impact of idiosyncratic factors. The model may not perform well outside the range of the historical values used for model calibration. One example would be the more recent uncertainties in global trade. The ongoing re-writing of trade agreements originating in the US and Europe around Brexit lead to uncertain cross-border flows of capital, goods, and services, which will have direct impact on corporate earnings. Any model built on historical assumptions about such flows could thus perform less effectively in the future.

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